

EX LIBRIS

Main Lib. AGRIC. DEPT.

5012
1632

Department of Agriculture Bulletin

Published monthly by the Department of Agriculture of the State of New York

Entered as second-class matter March 2, 1911, at the post office at Albany, N. Y.,
under the Act of June 6, 1900

ALBANY, N. Y.

JANUARY, 1916

Bulletin 79

(Part I)

The Fruit Industry in New York State

Part II is a continuation of Part I and treats—in a manner similar to apples—pears, peaches, cherries, plums and prunes, quinces, grapes, and small fruits. An article on fruits in the home completes the bulletin.

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE

CHARLES S. WILSON, Commissioner

Bulletin 79

(Part I)

The Fruit Industry in New York State

UNIV. OF
CALIFORNIA

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

5B359
NA

Main Lib.

AGRIC. DEPT.

NO. 359
5B359

CONTENTS

	PAGE
Introduction	635
The Fruit Districts of New York, U. P. Hedrick.....	638
The Nursery Industry in New York, Samuel Fraser.....	646
Various Methods of Refrigeration and Its Advantage to the Public, George H. McKay.....	662
The Apple Grading Law, B. D. Van Buren.....	669
The Apple-packing Train, F. S. Welsh.....	679
Inspection Work of the Department of Agriculture in Relation to Horticulture, Dr. George G. Atwood.....	684
History of Fruit Exhibits at State Fair, H. B. Knapp.....	694
Horticultural Exhibits and What They Mean to the Fruit Interests of the State of New York.....	706
Exhibit of New York Fruit at the Columbian Exposition, Edward van Alostyne.....	706
New York Fruit at the Pan-American Exposition in 1901, F. E. Dawley	707
New York Fruit at the Land Shows and San Francisco Exposition, Charles G. Porter.....	710
The Western New York Horticultural Society, John Hall.....	717
The New York State Fruit Growers' Association, E. C. Gillett.....	727
Hudson River Fruit Exchange, W. Y. Velie.....	731
The Apple.....	741
Introduction of the Apple into America and New York State, Charles S. Wilson.....	743
The Apples of New York, Prof. S. A. Beach.....	761
Soil Types for Varieties of Apples, H. J. Wilder.....	769
Tillage, W. H. Chandler.....	776
Cover Crops, R. D. Anthony.....	785
Intercropping the Young Orchard—From an Economic Standpoint, M. C. Burritt.....	794
Sod Mulch vs. Tillage for Apple Orchards, W. D. Auchter.....	803
Fertilizers for Fruits, U. P. Hedrick.....	811
Care of Young Trees, William Hotaling.....	816
Care of the Old Orchard, Roy P. McPherson.....	824
Pruning, Edward van Alostyne	830
Insects Particularly Affecting the Apple, Dr. E. P. Felt.....	842
Some of Our Most Common Apple Diseases, H. H. Whetzel and Lex R. Hesler.....	855

The Apple — Continued:	PAGE
Dwarf Apples, U. P. Hedrick.....	871
The Profits on a Barrel of Apples, U. P. Hederick.....	889
Central Packing Houses for New York Fruit, F. S. Welsh.....	895
Selling on Commission and Buying Direct from Producers, J. H. Killough	906
Exporting Apples, C. W. Kimball.....	911
Auction Houses as Distributors of Fruits and Vegetables, Victor K. McElheny, Jr.....	915
Receipts and Prices of Apples in New York City and Exports of Apples from United States and Canada, H. B. Knapp.....	927
The Evaporated Fruit Industry in New York State, E. W. Catchpole..	937
Grafting and Budding, Dr. George G. Atwood.....	957
Physical Injuries to Trees, B. D. Van Buren.....	963
Statistics	965
Index	967

ILLUSTRATIONS

	PAGE
Fig. 162. Map of New York State Showing Fruit Districts.....	641
Fig. 163. Block of One-Year Bartlett Pears.....	647
Fig. 164. Close View of One Type of Digger.....	652
Fig. 165. Rear View of Trencher.....	653
Fig. 166. Planting Nursery Stock.....	654
Fig. 167. Rear View of Firmer.....	655
Fig. 168. Northern Spy Grafts, One Year Old.....	658
Fig. 169. Exhibition of Cold Storage Apples.....	663
Fig. 170. Cold Storage House at Kendall, Orleans County.....	664
Fig. 171. Morton Cold Storage Plant.....	666
Fig. 172. 3,600 Baskets of Peaches in Storage.....	668
Fig. 173. Apple-packing Train, and Men Who Gave Advice to Apple Packers	680
Fig. 174. The Fruit Exhibit as It Appeared from 1895-1910.....	695
Fig. 175. The Grange Exhibit That Won First Prize in 1912.....	697
Fig. 176. One of the Early County Exhibits.....	698
Fig. 177. The First Prize Plate of Bartlett Pears in 1911.....	699
Fig. 178. The First Prize Plate of Elberta Peaches in 1911.....	700
Fig. 179. An Ontario County Exhibit, 1911.....	701
Fig. 180. The Ulster County Exhibit—Winner of First Prize in 1915...	703
Fig. 181. The Fruit Exhibit, 1915.....	704
Fig. 182. Exhibit of New York Apples at the New York Land Show, 1912.	711
Fig. 183. Exhibit of New York Apples at the Chicago Land Show, 1913..	713
Fig. 184. New York Fruit Exhibit at Panama Exposition.....	714
Fig. 185. W. C. Barry, President, Western New York Horticultural Society, 1915-16.....	718
Fig. 186. Pioneers of the Western New York Horticultural Society....	720
Fig. 187. Snapshot of an Afternoon Session.....	725
Fig. 188. Exterior of Office of Hudson River Fruit Exchange.....	731
Fig. 189. Office of Hudson River Fruit Exchange.....	734
Fig. 190. Storage Room of Hudson River Fruit Exchange.....	735
Fig. 191. Loading by Carload at Milton, N. Y.....	737
Fig. 192. Loaded Fruit Wagons.....	738
Fig. 193. Unloading Feed.....	739
Fig. 194. Monument to McIntosh Red.....	745
Fig. 195. Marker Erected to Original Northern Spy.....	747
Fig. 196. Tablet to Primate Apple Tree.....	751
Fig. 197. Indian Apple Tree, Nearly 200 Years Old.....	752
Fig. 198. Granite Shaft Commemorating the Baldwin Apple.....	757
Fig. 199. Ancient Rhode Island Greening Tree, About 200 Years Old....	759
Fig. 200. Block of Granite Commemorating the Wealthy Apple.....	760
Fig. 201. Map Showing Apple Growing Districts of New York State....	763
Fig. 202. Cover Crop of Red Clover in Peach Orchard.....	777

	PAGE
Fig. 203. Cover Crop of Red Clover, with Wild Grass.....	779
Fig. 204. Buckwheat as a Cover Crop in a Young Pear Orchard.....	780
Fig. 205. Young Apple Orchard Belonging to College of Agriculture, Ithaca, N. Y., with Dwarf Essex Rape as Cover Crop.....	782
Fig. 206. Cover Crop of Red Clover in a Thirty-three-Year-Old Orchard..	783
Fig. 207. Canada Peas and Buckwheat.....	787
Fig. 208. Mammoth Clover in October.....	788
Fig. 209. Wheat and Cowhorn Turnips in a Young Vineyard.....	789
Fig. 210. Rye and Winter Vetch.....	790
Fig. 211. Cow Peas Killed by an October Frost.....	792
Fig. 212. Beans in a Young Orchard.....	797
Fig. 213. View of Orchard Where Test was Carried on.....	804
Fig. 214. Tillage vs. Sod Mulch.....	806
Fig. 215. Tompkins County Kings Growing Under the Mulch System....	808
Fig. 216. Square Method of Planting.....	818
Fig. 217. Method of Planting in Equilateral Triangles.....	818
Fig. 218. Cherries Interplanted with Carrots.....	821
Fig. 219. Low-headed, Well-shaped Apple Trees.....	822
Fig. 220. A Well-kept Orchard.....	825
Fig. 221. Spraying the Orchard.....	827
Fig. 222. Apple Orchard in Blossom—the Wrong Time to Spray.....	828
Fig. 223. Baldwin Trees Fifteen Years Old, and the Product of One Tree.	830
Fig. 224. Greening Tree Twenty-two Years Old, Headed Four Feet from the Ground.....	833
Fig. 225. Low-headed Apple Tree.....	835
Fig. 226. Greening Tree Improperly Pruned.....	836
Fig. 227. High-headed Apple Tree, Sixty Years Old.....	837
Fig. 228. Views of a Properly Made Cut.....	839
Fig. 229. Improper and Proper Cuttings of Limb.....	840
Fig. 230. Twig Infected with San José Scale.....	843
Fig. 231. Common Scale Insects.....	844
Fig. 232. Aphis Apples.....	845
Fig. 233. Side-wormy Apples.....	847
Fig. 234. Side-wormy Apples in Sections.....	849
Fig. 235. Side Injury.....	850
Fig. 236. Apples Injured by Green Fruit Worm.....	852
Fig. 237. Work of Round-headed Apple Tree Borer.....	853
Fig. 238. Half-grown Apples Badly Scabbed.....	857
Fig. 239. Scab Spots on Apple Leaves.....	859
Fig. 240. Black Rot Canker on Apple Limb.....	861
Fig. 241. Apple Showing Stippin or Bitter Pit Spots.....	864
Fig. 242. European Canker.....	866
Fig. 243. Illinois Apple Tree Canker.....	868
Fig. 244. Sooty Blotch.....	869
Fig. 245. Flyspecked Type of Sooty Blotch.....	870
Fig. 246. Van Alstyne Orchard—Manner of Pruning at Transplanting..	873
Fig. 247. Tree on Doucin Stock Before and After Pruning.....	875
Fig. 248. Defects of Trees on Doucin Stock.....	877
Fig. 249. Root System of Apple Trees.....	879

	PAGE
Fig. 250. Wagner Apple Trees on Paradise Stock Blown Over.....	881
Fig. 251. Wood Orchard Trees on French Crab, Doucin and Paradise Stocks	883
Fig. 252. Central Packing House with Seven Mechanical Graders.....	897
Fig. 253. Usual Floor Plan of Packing Houses.....	899
Fig. 254. Arrangement of Graders in Packing House.....	899
Fig. 255. Skylight over Graders and no Posts to Interfere with Team Delivery	901
Fig. 256. California Citrus Fruits Sold at Auction.....	917
Fig. 257. Sale of Grapes in Auction Companies' Main Salesroom.....	921
Fig. 258. Receipts of Apples in New York City, 1894-1904.....	928
Fig. 259. Receipts of Apples in New York City, 1904-1914.....	929
Fig. 260. Percentage of Receipts of Apples in New York City.....	930
Fig. 261. Price of Baldwin by Months.....	930
Fig. 262. Price of Rhode Island Greening by Months.....	931
Fig. 263. Price of Northern Spy by Months.....	932
Fig. 264. Price of Tompkins King by Months.....	932
Fig. 265. Price of Ben Davis by Months.....	933
Fig. 266. From What State Do You Draw Your Apples?.....	933
Fig. 267. Exports from United States.....	935
Fig. 268. Exports from Canada.....	935
Fig. 269. Average Annual Imports in Foreign Cities.....	936
Fig. 270. Orchard of E. W. Catchpole & Sons, Alternate R. I. Greening and Twenty Ounce in Row.....	938
Fig. 271. Ben Davis Apples in Orchard of E. W. Catchpole & Sons.....	939
Fig. 272. Evaporating Plants in State of Missouri Operated by Men from New York State.....	941
Fig. 273. Large Kiln Plant at Sanborn, N. Y.....	942
Fig. 274. Plant of J. G. Wright, Wilson, N Y.....	943
Fig. 275. Four-kiln Plant and Workroom.....	944
Fig. 276. First-floor Plan of Six-kiln Plant.....	945
Fig. 277. Second Floor of Six-kiln Evaporator, Showing Bleacher.....	947
Fig. 278. Triumph Power Parer.....	948
Fig. 279. Slicer Used in Evaporating Plant.....	949
Fig. 280. Rings of Fancy Evaporated Apples.....	950
Fig. 281. Faced End of Box of Fancy Evaporated Apples.....	952
Fig. 282. Splice or Tongue Grafting.....	958
Fig. 283. Cleft Grafting.....	960
Fig. 284. Bridge Grafting	962
Fig. 285. Budding	964

ORCHARD BLESSING

*This day two hundred years ago,
The wild grapes by the river's side
And tasteless groundnuts trailing low,
The table of the woods supplied.*

*Unknown the apple's red and gold,
The blushing tints of peach and pear;
The mirror of the river told
No tale of orchards ripe and rare.*

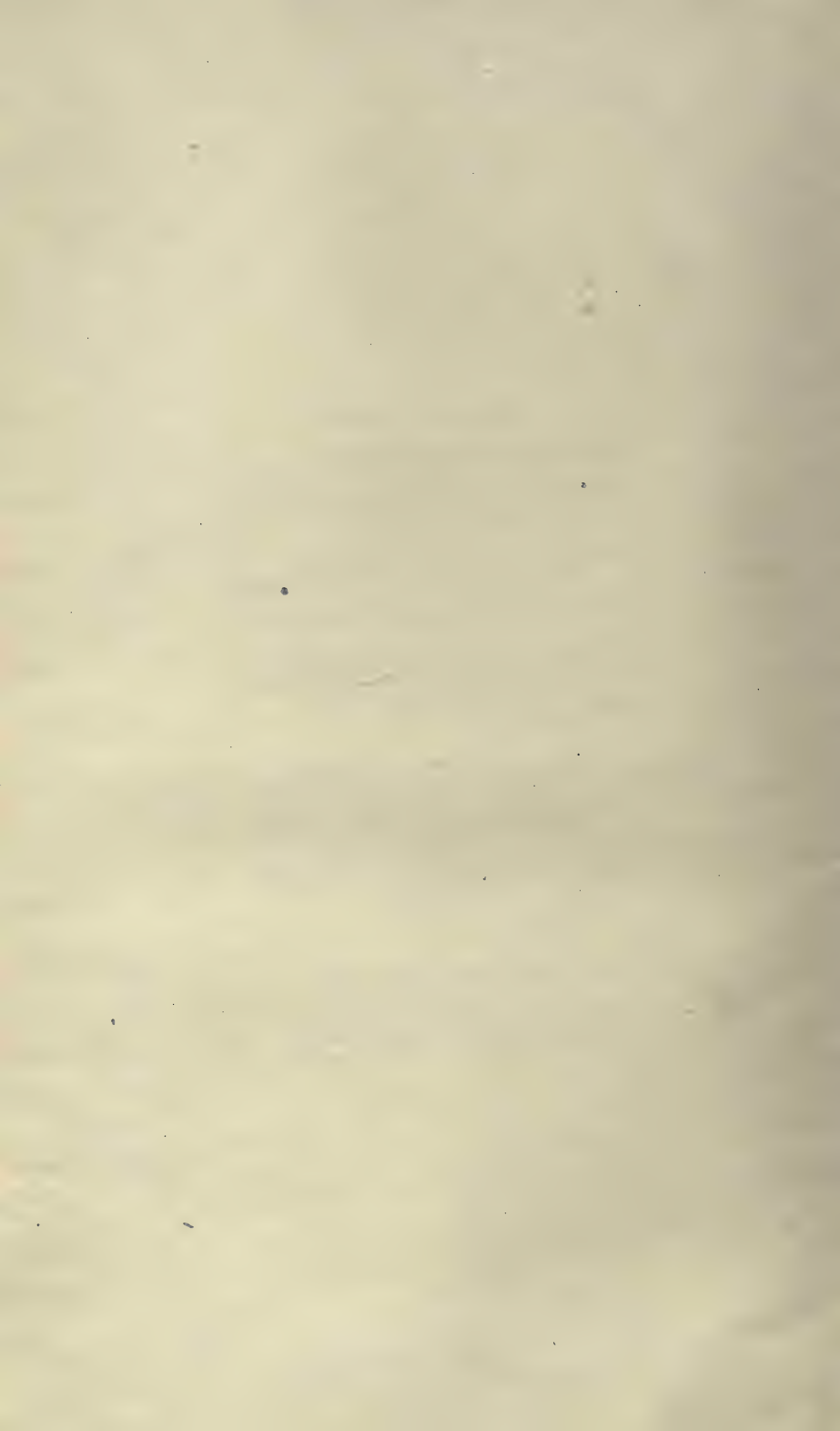
*Wild as the fruits he scorned to till,
These vales, the idle Indian trod;
Nor knew the glad creative skill,
The joy of him who toils with God.*

*O painter of the fruits and flowers!
We thank thee for thy wise design,
Whereby these human hands of ours
In Nature's garden work with thine.*

*Give fools their gold and knaves their power;
Let fortune's bubbles rise and fall;
Who sows a seed or trains a flower,
Or plants a tree, is more than all.*

*For he who blesses most is blest;
And God and man shall own his worth
Who toils to leave as his bequest
An added beauty to the earth.*

WHITTIER





INTRODUCTION

Fourth in order of value among our state products are our fruits, valued at \$24,826,066, according to the last federal census, 1910. This places New York first in the list of states for her horticultural products. Eliminating the citrus fruits of California, she produces more fruit than any two other states combined. The bulk of this fruit comes from a limited area as compared with the whole, yet there is not a county where some fruit is not grown and where the amount could not be materially increased.

If for no other reason than for the magnitude of the industry, horticulture should have a prominent place in the series of publications which the Department of Agriculture is putting out through the Bureau of Farmers' Institutes. Aside from its magnitude, another reason why horticulture should loom large in the eyes of everyone interested in the land and its products is that it has always stood for the highest type of agriculture. When the sacred writer attempted to portray what would be most tempting to primitive man, he pictured a tree whose fruit "was good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise." Again, at the close of the sacred volume, when St. John was setting forth his vision of the celestial country along with the streets of gold and gates of pearl, he described "the tree of life which bare twelve manner of fruits, and yielded her fruit every month: and the leaves of the tree were for the healing of the nations."

More than once since the time of our first parents has the tree loaded with fruit been pleasant to the eye and proved a temptation not to be resisted by men from other walks of life than agriculture, many times with much more pleasing results than are recorded in the first case. Wherever and whenever civilization has been at its highest, horticulture has occupied a prominent place, illustrating that only when man supplements by his efforts the works of his Creator do the products of the tree and vine most nearly attain perfection, as instanced by the wild fruits as

found in nature and those literally "pleasant to the eyes and good for food," developed by the skill of man.

In this volume we have set forth the location and extent of the growth of the several fruits of the state, and, in considerable detail, matters connected with their production and handling, to show the effort and skill which has been and must be put forth; in order that not only our own people might appreciate their goodly heritage and opportunity, and have the knowledge necessary for making the most of it, but that others who are seeking desirable places to locate, together with a knowledge of the business, may have authentic, first-hand information, and learn that in many places in the Empire State they will find land where they can literally grow "twelve manner of fruits"—and in close proximity to great cities, even though they be not altogether celestial ones—and that we gladly give them of our best in the way of knowledge of the craft.

Prof. U. P. Hedrick, horticulturist at the State Experiment Station, has been the "man of our counsel" and a tower of strength. His seven articles clearly indicate this, but in addition the compiler would accord his appreciation of the assistance so cheerfully given through the months during which this volume has been under preparation. Mr. O. M. Taylor of the same place has given most valuable help with all things pertaining to small fruits. New York fruit growers will welcome the sight of the face and gladly read the words of their old friend and counselor, Professor S. A. Beach, of Iowa, as well as those of Professors Blake, Henry, and Gulley from outside the state.

As in other bulletins of this character, we have not hesitated to call for expert matter from the scientist at our College and our Experiment Station, and again they have freely given of their best, as have the many others over the state to whom we have appealed because they were able to speak with authority and had a message for the multitude. Of all of these the readers will testify that their articles are living witnesses of the truth of the above. To all such, in the name of my readers as well as in my own, I record our obligation and appreciation.

The compilation has required many hours of labor and a volume of correspondence, but it has been a pleasant task to

gather together and set in order this "basket of summer fruits." That they may be pleasant to the eye and help to make the readers wise is the wish of the compiler.

EDWARD VAN ALSTYNE,
Director of Farmers' Institutes.

THE FRUIT DISTRICTS OF NEW YORK

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.



New York ranks first in the culture of deciduous fruits among the states of the Union. It is prominent in this division of agriculture chiefly because its climate and soil are so diverse and so favorable as to make possible highly specialized pomological areas. It is most desirable to know the boundaries of these areas in order that the fruit-grower may be able to specialize more closely, for each fruit and each variety of fruit has a set of conditions best

suited to it. We wish, then, to set forth briefly in this article the condition of soil and climate to be found in the several physiographic divisions of New York in which fruit growing is a prominent feature of agriculture. First, let us glance at the state as a whole.

New York extends east and west 412 miles, and north and south 310 miles. It contains within its borders 30,498,560 acres, about three-fourths of which is farmed land. The state has a wide range in altitude, as may be seen by the following figures: One-twentieth of the total area, chiefly comprising Long Island, lies below an altitude of 100 feet; sixteen-twentieths between an elevation of 100 and 1,500 feet; while three-twentieths rise above 1,500 feet, the maximum altitude being above 5,000 feet in a few places in the Adirondacks.

New York is drained by five water systems. The drainage water in a small area in the southeast passes off through the Delaware; the Hudson and the Mohawk drain the eastern part of the state; the excess waters in central and western New York pass to the ocean through the Great Lakes and the St. Lawrence; the drainage of the southwestern part is through the Allegheny into the Mississippi system; while the Susquehanna carries the

waters of south-central New York into Chesapeake Bay. These several water systems are prominent factors in the fruit districts of the state.

At first thought it would seem that pomological districts would be outlined somewhat in accordance with soils. Yet soils cut but small figure in the formation of fruit regions in New York, because, excepting a small area in the southwestern part of the state, the soils have been formed by glacial action and have then been carried to and fro until nowhere can uniform soils be found over large areas. And so, though most important in selecting locations for a fruit farm, soils help but little in dividing the state into fruit districts.

It is through its physical features, then, that the state is divided into fruit districts. There are nine of these, each quite distinct in natural vegetation and in its agriculture and horticulture. The nine regions are shown in the accompanying map and are briefly described in the paragraphs that follow.

LONG ISLAND

This district is composed of the sandy lowland of Long Island. Its formation is a low plain covered with a thick deposit of glacial drift, in which sand predominates. All of the deciduous fruits may be grown in this district, and several, as the apple, peach, cherry, grape, and strawberry, can be grown preeminently well. The varieties of the fruits cultivated here, however, are not distinctive. The limits of the northern and the southern sorts seem to meet, giving a great number of varieties for the district and making it difficult to form definite lists of the fruits. This is the only district in which cranberries are largely grown in New York.

Fruit growing cannot be said to be generally developed on Long Island. Market gardening is the mainstay in agriculture in this part of the state, and is probably more profitable. There are, however, many small plantations, the products from which are sold, and nearly every farm home has more or less fruit about it. Opportunities for profitable fruit growing in this region have seemingly been neglected, and the industry is backward, considering what could be done.

HUDSON VALLEY

This region lies on both sides of the Hudson from Long Island to the valley of Lake George as far north as Warren and Washington counties. The varied topography and the several geological formations giving different soils make it possible, and probably desirable, to subdivide this district into several secondary regions in which nearly all of the deciduous fruits and many of the varieties are grown. In no part of the state is climate and soil, and consequently its productions, more varied than in the Hudson Valley district.

Where the region touches the seashore, and for several miles inland, fruits as grown on Long Island will thrive. In the northern part of the region and in the high altitudes, the varieties grown further north in the Champlain Valley are at home. It would be hard to say what the leading fruit is in this district. Without doubt the apple is most largely planted; but peaches, plums, and cherries are all of considerable commercial importance, while in one part or another of the valley may be found localities which specialize in grapes, currants, or strawberries. In no other pomological district in the state are the fruits quite so diversified.

Here in New York if not in America, fruit growing as a business may be said to have had its origin during the middle of the last century. Possibly for this reason the industry for the last quarter-century has been a little slack — old methods and old varieties have been permitted to linger too long. But there now seems to be a general advance in agriculture in the valley, and fruit growing is greatly improving. Certainly, opportunities for this industry are not better in any other part of the state.

ST. LAWRENCE AND CHAMPLAIN VALLEYS

The high and rolling land tributary to Lake Champlain and the St. Lawrence River, also such parts of the Adirondacks as are adapted to fruit growing, comprise this district. Three divisions could well be made of this district; the two valleys could be kept distinct, each to include only the area of lower land adjacent to the water, and the third would be the high uplands which run back into the Adirondacks. Fruits in the three districts do not differ greatly, and we have therefore included the three regions

THE FRUIT DISTRICTS OF NEW YORK



FRUIT DISTRICTS OF
NEW YORK STATE

in one. It is hardly necessary to say that only the hardiest varieties of the hardy fruits thrive in the uplands, and that only in favored locations near the water can any of the tender sorts be grown.

The apple is the only fruit grown largely for the market in this region, and that only on the shores of Lake Champlain and the St. Lawrence. Near both bodies of water, apple culture is capable of extension to the profit of those who are willing to play the part of pioneer. This is for the most part a great dairy region, and no doubt the continuous care of the animals and product required in this business accounts for the general neglect of fruits, even for the home, which is everywhere apparent in the district.

MOHAWK VALLEY

The valley of the Mohawk extends from Oneida Lake to the valley of the Hudson. This district is one of indistinct boundaries and possibly should be divided into the upper Mohawk and the lower Mohawk districts, in which case the lower Mohawk could include the Schoharie Valley, where some fruits succeed remarkably well. A fruit list for the lower Mohawk would include some sorts recommended for the Hudson Valley. Hardiness is a prime requisite for the upper Mohawk; although, since the season is somewhat longer, some varieties can be grown which will not thrive in the district to the north.

Dairying is the mainstay of agriculture in the Mohawk Valley, followed by general agriculture, with fruit growing of relatively small importance. Still, there are some commercial orchards of apples, and this fruit, with pears, cherries, and plums, is commonly found about farm and village homes. There are numerous plantations of small fruits—the strawberry in particular—about the many towns and cities in the Mohawk Valley, and at Ilion strawberry growing assumes a large scale. The commercial growing of all hardy fruits might profitably be extended along the lower Mohawk—particularly in the Schoharie Valley, where there is a considerable amount of good fruit land.

EASTERN PLATEAU

The Eastern Plateau embraces the Catskills and the high plateau to the west, reaching to the basin of the Central Lakes.

The western boundary of this region cannot be drawn with definiteness, but the eastern boundary is well drawn, being the highlands overlooking the Hudson Valley. Both the wild and the cultivated flora in this region are variable in its different parts, and in accordance with these differences, and to agree with the topography of the district, several subdivisions could be made. But it is an agricultural belt rather than a pomological one, though the apple succeeds remarkably well in some valleys, and the other hardy fruits can at least be grown for home use. In favored locations the culture of hardy tree fruits might well be extended and grown in sufficient quantities for local markets.

CENTRAL LAKES

The great basin, in which lie the Central or Finger Lakes, is a region of very indefinite boundaries, the fruit lands of which lie generally in the lower and more level lands near the lakes. Unusually favorable conditions prevail in this and in the district to the north for the growth of the apple — especially favorable in the climate. This and the following district comprise the Western New York apple belt, far famed for the quality and quantity of the product.

One of the chief assets of the Western New York apple belt, as has been indicated, is its climate. The climate as a whole is one of comparatively uniform temperatures and with well regulated conditions of humidity, both brought about by the large, deep bodies of water in or adjoining the districts. A wide range of varieties of the tree fruits, including the tender peach, is adapted to both districts, but a few sorts — in a commercial way at least — have gained and maintain the lead.

While the apple is the leading fruit in this district, the culture of all other tree fruits assumes large proportions. Probably more cherries and plums are grown in this district than in any other part of the state. Here, too, is found the second most important grape region, this industry being localized about Keuka, Canandaigua and Seneca lakes. Between Seneca and Keuka lakes, with Dundee as a center, is the seat of the dried black raspberry industry, over a thousand tons being produced annually. Throughout the whole region the culture of one fruit or another is carried

on profitably, the fruit plantations, as a rule, receiving the best of care.

ONTARIO SHORE

This district covers the whole of the plain along the shore of Lake Ontario from the valley of the St. Lawrence to the Niagara River, extending from the lake on the north several miles inland to an escarpment of limestone about 600 feet above the sea. The plain is broken up by a series of parallel hills—the drumlins of the geologists. It differs from the preceding district chiefly in the matter of soils. Several distinct types of soils found in the Ontario Shore district seem to be well suited to all tree fruits. The soil is mostly sandy or loamy, and is easily drained and worked. Soil and climatic conditions are such that trees are large, productive, and long-lived, and the fruit is of excellent quality.

While the apple is the leading fruit, peaches, pears, plums, and cherries are all important commercial crops—more peaches, at least, being raised here than in any other district. Greater or less quantities of grapes and all of the small fruits are grown. The great nursery industry is centered here, with Rochester as headquarters, though much of the stock is grown in the Central Lakes region about Geneva and Dansville. Generally speaking, fruit growing is more highly specialized and better practiced in this than in any other of the pomological regions of New York.

ERIE SHORE

This name is given the plain along the shore of Lake Erie from the Niagara River to the western boundary of the state—a very narrow strip of land bounded on the south by a high escarpment and gradually descending beneath the lake level on the north. This district is largely given up to grape growing, the culture of this fruit being by far the most important pursuit of the region. The district is perhaps better known as the “Chautauqua Grape Belt,” far famed for its Concord grapes produced for the general market and for the manufacture of grape juice. There are in this region about 35,000 acres of grapes—the largest area of native grapes under cultivation anywhere now growing.

Besides the grapes along the Erie Shore, all of the tree and small fruits are cultivated more or less for the markets. No doubt an increase in the culture of other fruits than the grape would greatly benefit the fruit growers of the district, since diversification would better employ labor and give more profitable yields on soils now planted to grapes but better adapted to some other fruit.

WESTERN PLATEAU

This district lies on the high plateau to the south of the Ontario and Erie Shores and west of the Central Lakes. This, like the Eastern Plateau, is a region of indefinite boundaries and varied topography, and of much less importance in the fruit industry than the neighboring districts. Only hardy fruits can be grown in this district, and it is doubtful if the culture of these should be attempted, except in very favorable spots, for more than local consumption.

THE NURSERY INDUSTRY IN NEW YORK

SAMUEL FRASER, GENESEO, N. Y.

MAGNITUDE OF THE INDUSTRY



According to the thirteenth census of the United States, the acreage in nurseries in 1909 was 87,618 acres, while in 1899 it was but 59,492 acres. In other words, a gain of 35.5 per cent in acreage was made in that decade; while in value of products the figures were \$10,123,873 in 1899 and \$21,450,822 in 1909, a gain of 107.9 per cent.

Taking the different divisions of the United States we find that in value of products the Middle Atlantic states rank first; the West North-Central division, second; the Pacific division, third; and the East North-Central, fourth. The state of New York reports the value of such products as \$2,703,000, which is greater than in any other state, California being second with a value of \$2,135,000, and Texas third with \$1,236,000. No other state produced \$1,000,000 worth. The acreage given for New York in 1899 was 8,248, while in 1909 it was 8,680; in other words, the acreage made a slight gain of 5.4 per cent in the ten years, but in value we see a remarkable gain of from \$1,642,107 in 1899 to \$2,750,957 in 1909, or 67.5 per cent. This increase in value, however, was not so high as that of the rest of the country. In 1911, the figures from Albany, N. Y., show 9,255 acres, and in 1912, the number of acres was increased to 9,918.

The nursery business has long been established in New York, and the firms engaged rank high in the industry. Of the five hundred members of the National American Nurserymen's Association, about 25 per cent are from the state of New York, which is significant when we remember that New York has but one-ninth the total acreage of the nursery industry and one-eighth of the total value.



FIG. 163.—BARTLETT BLOCK, ONE-YEAR BUDS — AN EXTREMELY UNIFORM AND VIGOROUS LOT; SOME FIVE FEET TALL.

The thirteenth census reports nursery products as being grown on 608 farms in the state of New York. Of this total, 306 did not grow sufficient for their stock to reach \$250 in value; in fact, the total value of these 306 places was only \$47,514, an average of \$155 per farm. The remaining 302 establishments reporting the value of products as over \$250 each, had an average of \$8,952 per farm. The census for 1899 gave the total acreage of nursery products and the value thereof as follows:

TABLE I

New York Counties	Acres	Amount of Sales
Albany	5.5	\$7,001
Allegany	7.5	5,050
Broome	6.75	4,750
Cattaraugus .....	....	141
Cayuga	53.5	5,680
Chautauqua	406.5	90,532
Chemung	15.0	1,994
Clinton	1.5	225
Columbia	8.0	1,215
Cortland .....	...	105
Delaware .....	...	31
Dutchess	19.5	2,985
Erie	61.5	15,350
Fulton	1.5	302
Genesee	220.0	42,242
Greene	2.5	2,050
Jefferson	3.5	76
Kings	2.75	7,853
Livingston	688.0	103,046
Madison	18.0	1,080
Monroe	3,118.5	621,230
Montgomery .....	.75	655
Nassau	199.0	44,103
New York	12.25	3,400
Niagara	133.0	19,335
Oneida	2.0	2,044
Onondaga	329.75	33,423
Ontario	1,033.75	230,174
Orange	102.5	12,880
Orleans	68.75	11,115
Oswego	5.5	2,363
Otsego .....	...	30
Queens	203.0	51,311
Rensselaer	31.0	12,040
Richmond	1.0	150
Rockland	1.5	801

New York Counties	Acres	Amount of Sales
St. Lawrence	8.0	\$969
Saratoga	5.25	1,300
Schoharie	5.0	2,500
Schuyler	56.5	15,846
Seneca	147.5	16,920
Steuben	3.0	365
Suffolk	240.75	22,052
Tompkins	8.5	2,185
Ulster	3.5	1,400
Washington .....	.5	1,256
Wayne	816.5	173,661
Westchester	137.5	62,521
Wyoming .....	.25	50
Yates	41.75	4,320
Total	8,238.25	\$1,642,107

At that time Monroe County with 3,118.5 acres was the leading county in the state, followed by Ontario with 1,033.75 acres, Wayne with 816.5 acres, Livingston with 688 acres, Chautauqua with 406.5 acres, Onondaga with 329.75 acres.

It is interesting to note that the difference in acreage from 1909 is but 5.4 per cent greater than it was in 1899; in other words, New York is pursuing a consistent policy. On the Pacific Coast the three states of California, Oregon, and Washington made a gain of 103.6 per cent, and every division showed a much greater gain than that of the Middle Atlantic states — New York, New Jersey and Pennsylvania. In New York, while the acreage did not change very much, the number of establishments increased from 485 in 1899, to 608 in 1909. The actual increase in value per acre was from \$199.33 in 1899, to \$316.93 in 1909. Taking the average of all the establishments, the value per establishment increased from \$3,386 to \$4,525. We cannot find the differences between the counties for the same decade, because they were not taken in the census of 1910.

After 1910, to 1914, there was a marked tendency to increase the planting, especially of apple trees, and the reports of the Department of Agriculture at Albany show the following totals:

TABLE II

	Report of 1911	Report of 1912	Report of 1913	Report of 1914
No. nursery certificates.	509	586	663	647
No. vineyard certificates.	42	28	37	33
Acres in nurseries.....	9,255	9,918	9,735	8,356
Acres in vineyards.....	2,233	1,297	736	1,181
Apple trees	14,350,000	19,246,000	21,038,375	18,640,177
Pear trees	6,700,000	7,185,000	7,097,166	6,897,547
Dwarf pear trees.....	1,100,000	970,000	981,544	1,086,262
Plum trees	8,600,000	8,263,000	5,256,204	5,133,381
Cherry trees	10,700,000	9,945,000	10,068,617	9,496,862
Peach trees	9,000,000	9,892,000	9,624,903	7,567,620
Quince trees	1,500,000	1,782,000	1,524,932	1,666,090
Apricot trees	*1,167,000	16,000	129,050	143,816
Ornamental trees	5,100,000	8,567,000	39,528,210	28,107,360
Ornamental shrubs.....	13,000,000	11,675,000	10,289,630	9,936,219
Currant plants	6,900,000	6,828,000	7,311,043	6,494,948
Grapevines (plants)....	15,580,000	24,465,000	18,047,412	19,119,805
Herbaceous plants	122,000	907,000	874,500	1,066,600
Gooseberry plants	2,116,000	1,835,000	2,050,371	1,986,508

*Probably an error.

Dr. George G. Atwood contributes the following:

"In 1912 there were about 20,000,000 apple trees raised in the state of New York. I believe that most of the apple trees are raised in the nurseries of Ontario, Monroe, Wayne, and Livingston. It is also true that the majority of the pears, plums, cherries, peaches, and quinces are produced in the counties named. Ornamental trees are grown mostly at Geneva, Newark, Rochester, Poughkeepsie, Yonkers, Flushing, and Westbury, and those grown by the State Conservation Commission number into the millions. Currants are grown most largely in Chautauqua County, but many are grown in Ulster, Ontario, Wayne, and Niagara counties. Comparatively few grapevines are grown outside of Chautauqua county. The bulk of the gooseberries are also raised in this county. Herbaceous plants are grown in the nurseries handling ornamental trees."

SOILS

The principal soil types in use in western New York are those of the Ontario and Dunkirk series. All types ranging from fine sandy loam to loam and clay loam are used, the tendency being to place the pears and plums on the heavier soil types and

the cherries, peaches, and apples on the lighter. Observant nurserymen frequently find it advisable to grow certain varieties of apples, such as Twenty Ounce, Williams Red, and Gravenstein, on the lighter loams, while they would not hesitate to plant such varieties as R. I. Greening, Baldwin, and McIntosh on heavy loams. For the production of the best specimens, the different varieties have their own requirements.

Mazzard cherry seedlings are planted on the gravelly loams, which must be well drained in order to give a good stand. The Mahaleb cherry seedlings can be grown on heavier land. A very slight excess of water will make the growing of the Mazzard cherry a failure. There is perhaps no more fickle plant in the nursery than this, which is undoubtedly one of the reasons why it is so little grown.

In New Jersey, where the nursery business has forged ahead in the last fifteen years, the Collington sandy loam derived from the green sandy marl common in Maryland and New Jersey has proven particularly well adapted to nursery production, while the principal soil used in the Huntsville area in Alabama is the red limestone called Decatur clay.

DISEASES ON CERTAIN SOILS

Formerly the presence of a slight amount of hairy root on an apple caused little comment, but today such trees are discarded. Since this is much more prevalent on heavy loam soils, there is a tendency to grow the apple on the lighter soils to avoid it. The Clyde loam is an excellent soil for the production of most types of nursery stock when well drained. It is land which previously grew elm trees; if allowed to stand, these will provide sources of infection for wooly aphis—one of the most serious pests today in the apple nurseries of western New York. Consequently, trees of this type must be removed some time previous to the usage of the soil for nursery production, in order that the whole may be cleared of this insect.

Clyde loam, as well as many fields of Dunkirk loam and clay loam, need thorough underdrainage before they can be profitably used for the production of nursery stock. In some cases the drains are placed thirty feet apart; in others, forty feet; and at a

depth ranging from thirty inches to three feet. The underdrainage of the land frequently costs from forty to fifty dollars per acre, or even more.

PREPARATION OF THE LAND

As already mentioned, the fields should be thoroughly underdrained if this be needed, and it is advisable that the land should have been used for the production of a good hay crop. If man-



FIG. 164.—CLOSE VIEW OF ONE TYPE OF DIGGER—A STOUT, U-SHAPED BLADE ON A STRONG FRAME, EQUIPPED WITH LEVERS FOR REGULATING THE DEPTH

ured for the hay crop, and the land thoroughly supplied with organic matter, the field should be in good condition for the growing of trees. The plowing is usually done in the fall; there is some difference of opinion as to whether subsoiling is profitable or not. In some instances the Spaulding deep-tilling tool is used, and the land is plowed fifteen inches deep; in others the first plowing eight inches deep is given, and the subsoiler is run in the bottom of the furrow with another team. In still other cases the land is plowed at a depth of nine to ten inches and appears to give satisfactory results. Undoubtedly, the local conditions and the experience of the person with the particular land in question are important factors.

Where an adequate supply of organic matter is obtained in this way, no fertilizers are used. There are two important factors to remember in the soil management: first, there must be a large supply of organic matter that can be liberated by constant tillage for the benefit of the plants; second, the soil must be sufficiently retentive of moisture so that the plants are never stunted at any time, and it must be sufficiently well drained so that tillage can be maintained at all times. Land sufficiently well drained for a farm crop may not be well enough drained for a nursery crop.

PLANTING

In the spring the land is well fitted before the seedlings are planted, which means that it should be like a garden. It is then rolled. A trench is opened with a trencher which carries a marker attached, the rows usually being made about forty inches apart and according to whether the seedlings or grafts are to be planted. The method of planting varies. With some trenchers the trench remains sufficiently open so that the stock can be placed in by hand and a little soil pulled round it, but with others the soil falls back to such an extent that a spade is necessary to reopen the trench to permit of the seedling being pushed down to the proper degree. There is no use following a cheeseparating policy with nursery stock. Anything that does the work in a better manner is worth pursuing, because the total expenditure incurred is considerable and the neglect of one factor is serious.



FIG. 165.—REAR VIEW OF TRENCHER, OPENING FURROW FOR THE STOCK

Our custom is to plant at the back of the spade in addition to opening the trench, in order to get the roots down where we want them. Two men work together; one manipulates the spade and the other sticks the stock; the man who uses the spade kicks a

little soil toward the seedling after it has been placed, and tramps it. The stock is firmed with a firmer drawn by two horses. This compacts the soil tightly round the roots.

THE STOCK

Seedlings of certain fruits, such as apples, are grown to a considerable extent in this country. At the present time apples are grown to a large degree in Kansas and Missouri, and to a lesser degree in the East. Many eastern nurseries import their seedlings from France, and some from Holland. The French is looked upon with more favor because it seems to suit our conditions better. The stock is graded according to its caliper, a grade of



FIG. 166.— PLANTING NURSERY STOCK

10-12 mm. sometimes being made in the case of apple and pear — more often 7-12 mm. The second grade is usually 5-10 mm. or 6-9 mm.; third grade, 5-7 mm.; and fourth grade, 3-5 mm.

Prices vary, the first grade usually being worth three times as much as the third grade. Sometimes the small grades are kept in France and grown to be two years old. The buyer has to put confidence in his importer, and one of the most remarkable things about the whole nursery business is the fact that one must place confidence in the grower all along. In the case of plum and cherry, 5-9 mm. is a good grade; 3-5 mm. is also grown.

With plum, cherry, pear, quince, and peach, it is customary to propagate by budding. In the case of apples, both budding and grafting are used. I am speaking now with particular reference

to New York conditions. Grafts may be made with the whole root of the seedling, or a piece root. The nursery stock arrives here in December or January; during the months of February or March the nurserymen graft a twig of the current year's growth — perhaps about six inches in length — on a piece of root three or four inches in length, tie it with a piece of cotton and put it away in damp sawdust until such time as they are ready to plant. If the whole root is used, we have a collar graft, because the graft is made about the collar of the seedling. The seedlings as dug are divided into two classes — straight roots and branched roots. Straight roots are preferred for grafting because two grafts can usually be secured from them, the branched roots being reserved for budding.

There is a tendency to do more budding because the grafted tree seems to offer more opportunity for the entrance of the bacteria which cause crown gall, trees showing it not being considered merchantable. With some varieties, such as Gravenstein, crown gall seems to be present in the trees to such an extent that in certain seasons it seems to be almost impossible to

produce a tree free therefrom. The present system of discarding such trees entails so serious a loss that, unless some means is secured for eradicating some of these troubles, the growers of these trees will be forced to secure much higher prices or go out of business.

The increase in value per acre given in the census of 1909 as compared with that of 1899, does not measure the additional cost which is now incurred, due to higher labor and higher requirements; and the prospect for the future is that even greater care



FIG. 167.—REAR VIEW OF THE FIRMER, USED TO PACK EARTH AROUND NEWLY PLANTED GRAFTS OR SEEDLINGS

must be taken than in the past, with the consequent employment of a better type of labor at a higher salary, in order that the confidence necessary between the purchaser and the producer of nursery stock be maintained.

OUR SEEDLINGS

A century ago seedling apple trees were grown in New York, and whatever the fruit proved to be it was used either for consumption or cider. Today, we plant definite varieties. Nurserymen, however, use seedlings as roots for these varieties, and the characters of these are unknown. The so-called French Crab seedlings are the young plants raised from seeds collected from native fruits found growing in France, just as we might collect from our wild seedlings in New York. Some of these seedlings are strong growers, others are weak; some make good unions with the variety put upon them, others unite poorly. We have not standardized our roots; but, as soon as we get more data, this will probably be the next advance.

We find that some interesting relationships exist; for instance, the Twenty Ounce makes a more rapid growth when top-worked on Baldwin than it does on Northern Spy. I believe Tolman Sweet to be a better trunk than Spy. Wealthy does not grow well on R. I. Greening, although R. I. Greening grows well on Wealthy. Some of the apple seedlings we use for roots are quite susceptible to fire blight, and this is particularly true in the case of the French pear seedlings we use for our pears. The Myrobalan plum we use is but moderately satisfactory for plums. The Mazzard cherry is the best root for sweet cherries. The Doucin and Paradise apple stocks are propagated by layers, and peach stocks are usually grown from southern peach pits.

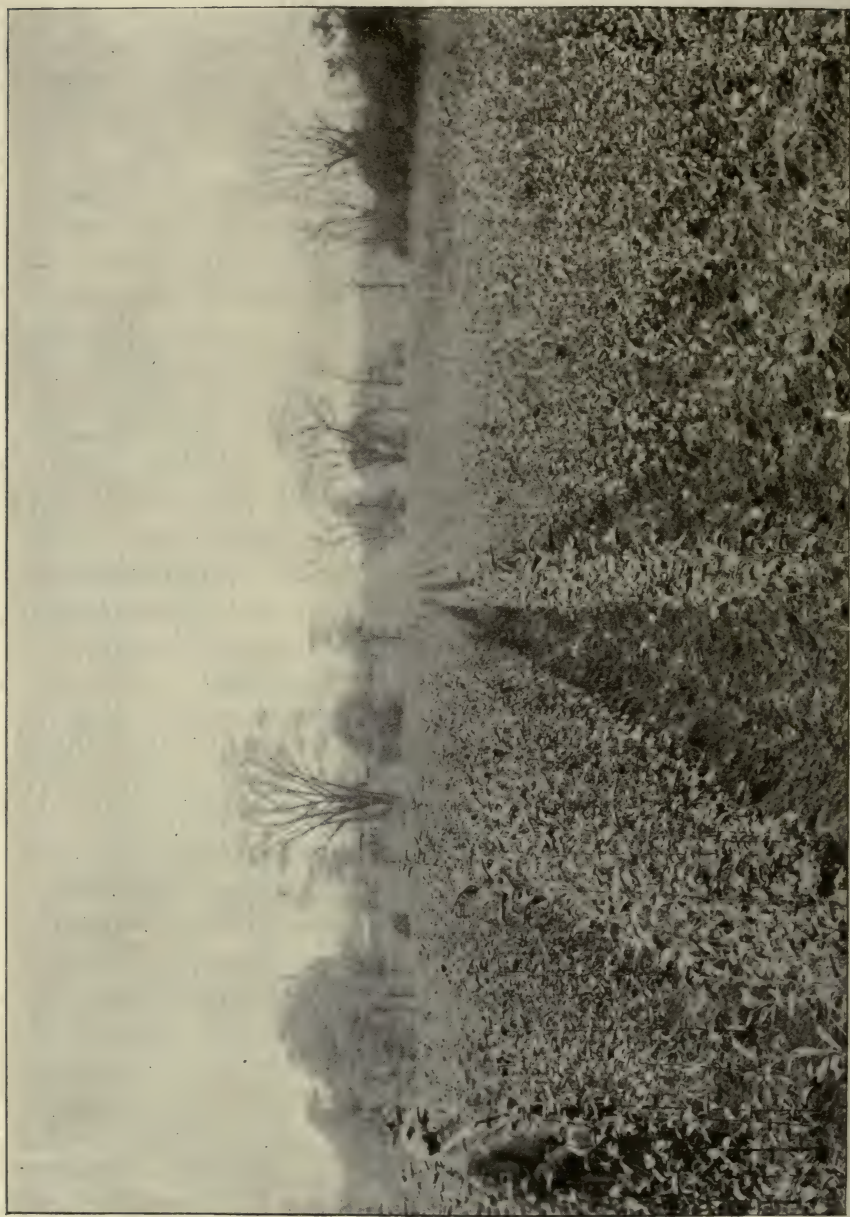
The root is half the tree. Some of our productive individual trees are such, very probably because they are on roots which are efficient providers. The man who first discovers why a certain tree is more efficient than its neighbor can revolutionize the fruit-growing business, for it is a positive fact that there is as high a percentage of boarder fruit trees in our orchards as cows in our herds. Why? The nurseryman needs to know; it is his problem as well as the orchardists.

AFTER-MANAGEMENT

After the little seedlings are planted and firmed, the first thing is to cultivate them. In many nurseries a one-horse cultivator is preferred; it is run twice through each row — up one side and down the other side of each row of stock. In others, two-horse cultivators are used. Constant horse-cultivation is given, with a hand-hoeing whenever necessary. Usually the attempt is made to go through with but one hoeing before budding. If the stock has favorable conditions and starts quickly, it is ready to bud any time after the middle of July. Where a considerable acreage is to be gone over, it is well to begin at about this date — probably with apples or pears, finishing these in time to do the cherries in August and finish the peaches the early part of September.

Two systems are employed in budding; in one a man sits down on a sack and pushes the bud upward, while in the other he stands and bends over and pushes the bud down. I think for apples and pears it makes little difference which is used, but in cherry-growing regions the pushing of the bud upward seems to be preferred. The buds are tied with raffia, and usually in about three weeks' time the union is secured and strings are cut. In the following spring the top is cut off the seedling just above the bud, and the bud starts into growth and forms the trunk of the new tree. When this is one year old — that is, when it has grown from April to fall — it may be sold as a one-year bud, or it may be grown another year and sold as a two-year bud.

The roots of a two-year bud and of a three-year collar graft are the same age. In many instances the graft will make a larger tree than the bud, and it is often practiced because it divides the work, getting a certain amount of it done in winter. The work of Professor Stewart at the Pennsylvania State College indicates that there is no difference in value in the orchard between a bud and a graft. There is, however, a tendency on the part of purchasers to prefer a budded tree. The writer is practicing budding to a greater extent, because one has more control over the propagation in that the buds can be cut and given out to the budders, one variety at a time, and if any are mislaid they rapidly dry out and are of no further use; whereas the



grafts must be cut in fall or early winter and put away for early spring use, and, if some are mislaid in the shop, they may be mixed with others. This is perhaps merely a matter of shop regulation, but a mixed block is a serious problem.

Usually a better stand can be secured from a graft than from a bud, and if one does not have the trouble from galls it is the most profitable way to propagate apples.

DIGGING

The nursery stock is usually dug by means of a U-shaped blade, which is run down the rows, severing the roots. It may be hauled by horses or by means of a cable attached to a drum driven by an engine at the end of the row. The cable saves injury from the horses to the limbs. The most common method of hauling is by the use of twenty horses.

NURSERY TROUBLES

One of the most common troubles of the foliage is aphids. If neglected, the little green aphid causes the leaves to curl and thoroughly poisons the plant system, completely stunting it if not checked. These aphides, not being equipped with a complete digestive system, inject a ferment into the plant which predigests the sap; they then suck this predigested sap into their system. It is this ferment which causes the stunting of the tree and the serious injury.

So far, nurserymen have combated these in a perfunctory sort of way, either by hand washing or by attempts at spraying. A satisfactory nursery sprayer is, I believe, yet to be built. There are several which are more or less satisfactory. Nicotine solutions and fish-oil soap are the means employed to combat the aphids.

The question of crown gall and hairy root of the apple have already been referred to as most serious menaces. Elaborate investigations have been made in regard to these troubles, of which there are several types. Propagation by means of budding tends to reduce both, as does also careful cultivation and the avoiding of wet soils, and prevents injury to the young trees. It is important that buds be taken from trees which are not affected. An

important distinction must be made between a fibrous-rooted tree and one affected by hairy root; a sharp distinction must also be made between warts or pimples on the root of the tree, and crown gall. The one is not injurious; the other may be. In other words, it takes an expert to decide whether a tree is affected by a disease or merely carries a blemish.

In New York, even trees affected by hairy root and crown gall have grown just as well as those which were not affected; further south, this condition may not be true. The reader is referred to Bulletin 186, "Field Studies of the Crown Gall and Hairy Root," by Hedgcock, also to Bulletins 213 and 255, by Dr. E. F. Smith, published by the Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

One other important disease which may attack root and branch is fire blight. No other means than the absolute removal of the affected tree seems to be of value.

Powdery mildew is controlled by spraying with lime-sulphur to which sulphate of iron has been added.

Scab on apple and shot-hole fungus on the cherry, and a number of other diseases of the leaves are controlled by spraying with lime-sulphur or bordeaux mixture.*

HISTORY

Within the past fifty years the commercial nursery came into being. William Prince of Flushing, L. I., is regarded as the pioneer of the industry. In 1825 his son issued quite a comprehensive catalogue listing several hundred species and varieties. The development of commercial orchard plantings in New York stimulated this branch of the nursery industry.

Sixty years ago no city in the United States had purchased an acre of land for park purposes; by 1899 there were probably 75,000 acres of city parks upon which \$11,000,000 per year were expended for maintenance and improvement, and the increase since that time has been remarkable.

In the eastern nurseries the attention given to ornamentals is

* See *Some Important Leaf Diseases of Nursery Stock*, Cornell Bulletin No. 358; *The Yellow-leaf Disease of Cherry and Plum in Nursery Stock*, Cornell Circular No. 31; *The Tarnished Plant Bug*, Cornell Bulletin No. 346.

greater than that given to fruit tree propagation. The planting of ornamental trees in the United States has barely begun. The opportunities for research and progress in this line are just dawning. What we should plant and where and how to arrange it in order to get effect is now receiving attention, and this means a demand in the future.

THE PURCHASE OF NURSERY STOCK

The purchaser of nursery stock must have confidence in the nurseryman. Frequently he cannot tell whether a tree is an apple or a pear — much less what variety it is, or whether it is a well-grown specimen for its age. The determination of all these points demands expert knowledge, which few purchasers of nursery stock possess. The price is the one thing the purchaser realizes; the value of the purchase he often fails to determine. Trees of the same variety, size, and appearance may vary in value because they differ in age. If there is a local nursery and the owner is of good repute, it is generally one of the safest places to go. There grows up an interchange of confidence which is necessary in all business. Failing this, one may take an expert along and visit the blocks of trees in a nursery and have the same expert inspect the trees on arrival; or the still more common method is to deal with a reputable firm, pay a fair price — that is, a price which leaves a living profit in the hands of the nurseryman — and rely on his integrity. The man who regards price as the index of value usually gets the low price and goods of a value equivalent to the price. The nurseryman who sells at cost, or says so, is a knave or a fool, and in either event you do not want to deal with him. There are a number of reputable nurserymen in all parts of New York, who are anxious to conduct a clean and honorable business, and the purchaser needs to approach them in the same spirit.

VARIOUS METHODS OF REFRIGERATION AND ITS ADVANTAGE TO THE PUBLIC

GEORGE H. MCKAY

Superintendent, Reading Terminal Market, Philadelphia, Pa.



For years refrigeration was openly discussed with disapproval by people who did not understand or who wilfully misrepresented it to the public. However, during the last few years the people in general have been enlightened by government investigations and by the interest taken by the different states in the subject, and it has been proven to be the only safe and sane method of preserving food products. Especially is it of advantage in times of overabundance and of oversupplied markets.

DIFFERENT METHODS OF REFRIGERATION

There are several methods of artificial refrigeration, but the most popular ones are the ammonia-expansion and the brine systems.

By the former method, ammonia is expanded by coils of pipes in the rooms; where by the latter system the brine is previously cooled by having been circulated in pipes submerged in tanks or cooling coils. The brine is then pumped through coils into the rooms. The latter method is the most popular, since it keeps rooms at a more even temperature.

However, there is another system which must not be forgotten—the old method of cooling and preserving products by ice. This is inexpensive and advisable in climates cold enough, where ice as easily procurable, also where goods need not be kept below 36 degrees Fahrenheit. Where it is necessary to keep goods below this degree, a compartment can be built and salt added to the ice. By having an up draft open at all times, and the downtake with slides to close the openings, a fairly even temperature may be maintained.

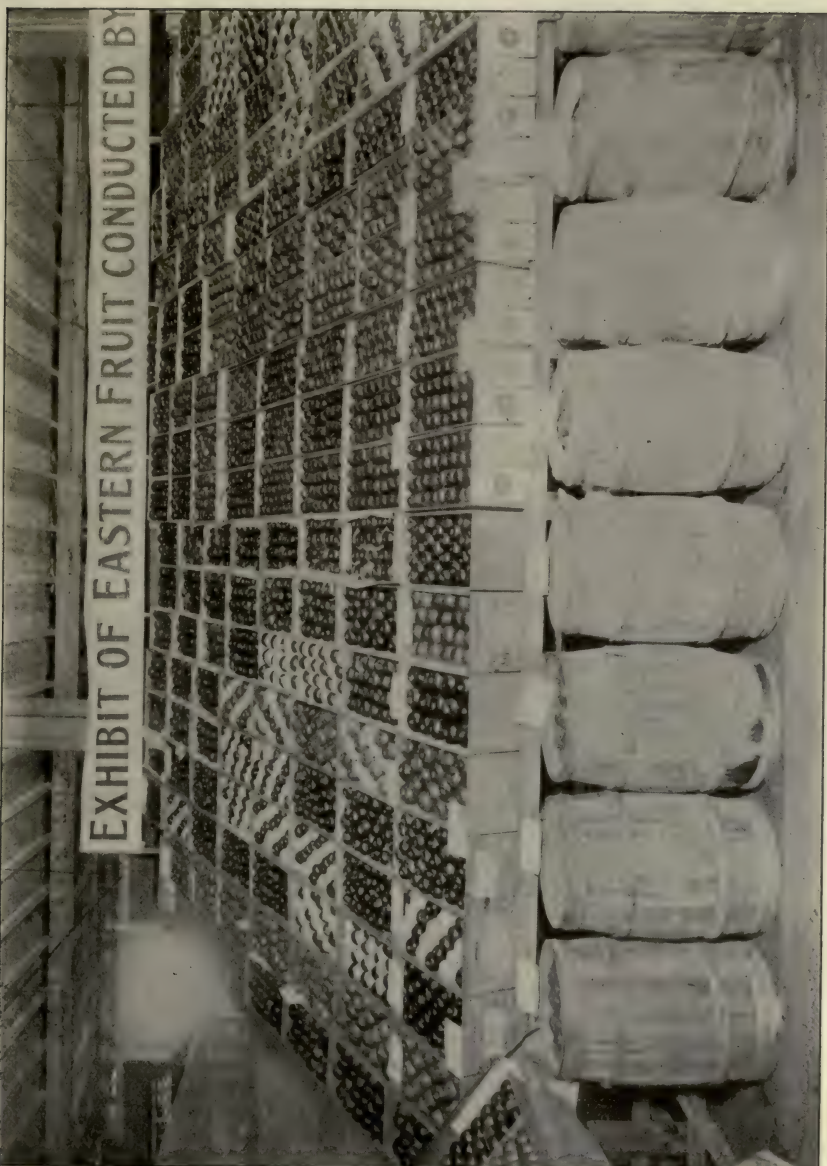


FIG. 169.—EXHIBITION OF COLD STORAGE APPLES

At the time these Apples were put in cold storage the current price for this grade was \$1.00 per barrel. When taken from cold storage they sold for \$3.50 per barrel

The up-to-date plant for today is the gas producer, which is run by gas or oil engines instead of boilers. Either one of these machines can be used very economically, and, compared with the boilers and steam, in the ratio of 7 to 1 in the former with 20 to 1 in the latter; that is, by the old method of boilers we made seven tons of ice with one ton of coal, while with the new method of gas producer or oil engines we can make 20 tons of ice with 1 ton of coal. This same ratio applies to refrigeration, but it doubles its capacity when the temperature is above 32 degrees.

The making of artificial ice also for commercial purposes is a great blessing, as it is chemically pure, and, since the sources of natural ice have become contaminated and unfit for household use, it should always be used in preference.



FIG. 170.— COLD STORAGE HOUSE AT KENDALL, ORLEANS COUNTY
(Courtesy of Kendall Cold Storage Co., Kendall, N. Y.)

SMALL PLANTS FOR FARMERS

Since most of the large cities and towns demand that the milk supply shall not be above 60 degrees F., it is necessary to have the milk cooled before shipment, thus necessitating refrigerating plants for farmers and dairymen. Therefore, hundred of these small plants are being erected by farmers and used for holding fruit as well as milk.

The cheapest way to refrigerate is where there is access to water power, which saves the expense of installing steam boilers and buildings attached. It is not necessary that the refrigerating plant be located on the stream, since electricity can be generated and the power sent any distance desired.

GROWTH OF REFRIGERATION

When refrigeration was first put into operation it was used mostly for butter, then demand was made for the storing of eggs, later poultry and meats, then apples.

For the last five years nearly all food — that is about 80 per cent of all food products in the United States — has been refrigerated. Within the last few years New York has increased her storage capacity 100 per cent, and many of her products are put away by speculators in times when they are cheap, and are held for higher prices. This applies more especially to apples and pears, while the West stores immense quantities of eggs and poultry. Pennsylvania also stores a great many, besides nearly all other farm products at certain times of the year.

THE READING TERMINAL MARKET

At the Reading Terminal Market, Philadelphia, there is, no doubt, one of the largest markets in the world where the manager caters to the grower and to the interest of the producer, and where the grower can store his goods and then sell at either retail or wholesale and at a good profit. For instance, we have some farmers who put away from 5000 to 6000 barrels of apples. Out of 20,000 barrels of apples which we have stored, 95 per cent are from people who grow them, many of whom have stands in the market where they can retail their apples at a good profit. To show how profitable it is, we have farmers from Pennsylvania, New Jersey, Delaware, and Maryland who rent stalls and come this distance from these four states respectively, four times each week.

Out of some thirty markets which existed twenty-five years ago in Philadelphia there is only one besides the Terminal Market which is a success, and I attribute it entirely to refrigeration. The farmers can ship their goods by rail during the



FIG. 171.—MORTON COLD STORAGE PLANT, MORTON, N. Y.
Erected in 1914. Filled to capacity, 65,000 barrels, in 1915. Entire construction of concrete.
(Courtesy of Morton Cold Storage Co., Inc., Morton, N. Y.)

summer in refrigerated cars direct to the refrigerating department, where they may be kept any desired length of time. If goods are not sold from the stands during the day they can be returned to the refrigerating department again; while, in other markets, whatever time the farmers were obliged to return home soon became known, and people learned to wait and take advantage of their selling at reduced rates in order to close out their goods. This discouraged hundreds of farmers and caused them to give up their stands in the markets.

ADDITIONAL COLD STORAGE NECESSARY

It is my opinion that, in order to give the producer an opportunity, large markets and storage houses or refrigerating plants must be erected in different parts of the city. Not only steam but trolley lines should have their switches run directly into the plants, so that when perishable produce is plentiful it could be held until later when the farmers could realize a good price.

While a great deal of discussion has been going on and much money spent by the state in the distribution of farm products, and while we have raised a splendid crop of products, it has been very discouraging for the farmer; the prices he received were entirely inadequate for the labor expended. There has been no method of holding his goods until the market becomes better.

KEEPING PEACHES AND PEAS

The last few years we have been making a special effort to keep peas and peaches. We found that they can be kept from four to five weeks and come out in good condition. Many cases of peaches were put in at fifteen cents per basket and in three weeks were sold for from forty to eighty cents per basket. Peas put away when they practically could not be sold were kept three weeks and then sold at from fifty to sixty cents per basket.

The thorough investigation now in progress in New York has established the fact that, while there are large refrigerating plants in the cities and also in the country, yet they are not sufficient for the storage of products, or else they are operated in the interest of the speculator.

PRODUCER AND CONSUMER SHOULD BE BROUGHT TOGETHER

The farmers should organize and instruct their representatives in the legislature to endeavor to have laws passed which would improve facilities of refrigerating farm products for the farmer; also to keep in touch with railroad officials for better transportation and large refrigerating warehouses where products could be stored. In interviews with officials of the several railroads enter-



FIG. 172.—3,600 BASKETS OF PEACHES IN STORAGE

At the time they were stored peaches were selling for fifteen cents a basket; when taken out of storage these peaches sold for \$1.10 a basket

ing Pennsylvania and New York, I find they are exceedingly anxious to do all in their power to get the producer into closer touch with the consumer.

Measures are being taken for the erection of more terminals and markets where the producer can sell his products more directly to the consumer and thus decrease the high cost of living. These measures, with the scientific methods of farming whereby more and better food can be produced per acre, will increase the profit of the farmer as well as bring more wholesome food to the consumer.

THE APPLE GRADING LAW

B. D. VAN BUREN

Assistant Chief, Bureau of Plant Industry, New York State Department of Agriculture, Albany, N. Y.



This law is the outgrowth of several years of legislation, starting with the optional grading law, which made practically no improvement in the grade of apples packed by New York State growers or dealers during its operation. In 1914 this law was amended and made compulsory, its provisions applying to all apples grown in New York State and packed in closed packages for sale, with the one exception that apples packed and branded in accord-

ance with the federal law were exempt from the provisions of this law.

The law as passed in 1914 was favored and supported by the various fruit growers' associations of the state and also by the National Apple Shippers' Association, which has a large membership in this state. A clause in the law put its enforcement into the hands of the Commissioner of Agriculture, but did not make it a part of the New York State Agricultural Law. On account of this fact, and because of certain conflicting clauses in the law passed in 1914 and the provision therein that only those who knowingly violated it were subject to prosecution, its enforcement was found to be practically impossible, and the legislature of 1915 passed a new apple grading law and repealed the law passed in 1914. This new law was made part of the agricultural law of New York State, and, therefore, its enforcement became one of the duties of the Commissioner of Agriculture.

Under the agricultural law the Commissioner of Agriculture or his agents have the right to enter warehouses, stores, etc., and open and inspect packages, all of which is a great aid in enforcing a law of this character. In this new law, passed in 1915, the conflicting clauses were largely eliminated, as was that part of

the law holding only those who knowingly violated its provisions to be guilty and subject to fine. The apple growers of the state evidently thought such a law was needed to protect the consumer and also raise the reputation of the packs and grades of our apples.

Investigation has shown that the work the Department of Agriculture has done this year, together with the cooperation of a large number of the commercial growers and packers within the state, has resulted in greatly improving the grading of apples packed in closed packages. During November and December, 1915, at least 80 per cent of the apples being marketed in such packages were packed and branded in accordance with the requirements of the law. Lack of color, the fungus known as apple scab, the fungus known as sooty blotch, and insect injuries caused by codling moth larvæ, curculio, aphids, and red bug are apparently the most troublesome defects to the grower and packer. Of these, apple scab has given the packer as much trouble as all the rest combined, and it is doubtful if either New York standard fancy, New York standard A, or New York standard B grade can be packed from a crop infected with apple scab, particularly if the apples are held for any length of time after packing or are delayed to any extent in transit.

The texture and flavor of New York apples are of the best, and their appearance in many instances cannot be excelled, but the quality of the pack in the past has been so unreliable that the best retailers have been afraid to handle the goods. The law is changing this situation rapidly, and its influence is already being felt in that it is making the movement of apples more easy, and the buyers feel that there is beginning to be something much more definite about the grade of the apples grown and packed in the Empire State.

AGRICULTURAL LAW IN RELATION TO APPLES

§ 262. That the standard grades or classes for apples grown in this state when packed in closed packages shall be as follows:

First: "New York standard fancy grade" shall consist of apples of one variety, which are well grown specimens, hand-picked, properly packed, of good color for the variety, normal shape, free from dirt, diseases, insect and fungus injury, bruises

and other defects except such as are necessarily caused in the operation of packing; or apples of one variety which are not more than five per centum below the foregoing specifications on a combination of all defects or two per centum on any single defect.

Second: "New York standard A grade" shall consist of apples of one variety which are well grown specimens, hand-picked, properly packed, normal shape, practically free from dirt, diseases, insect and fungus injury, bruises and other defects except such as are necessarily caused in the operation of packing; or apples of one variety which are not more than ten per centum below the foregoing specifications on a combination of all defects or five per centum on any single defect. No apples in this grade shall show less than thirty-three and one-third per centum of good color for the variety.

Third: "New York standard B grade" shall consist of apples of one variety which are well matured, hand-picked, properly packed, practically normal shape, practically free from dirt, diseases, insect and fungus injury; or apples of one variety which are not more than fifteen per centum below the foregoing specifications on a combination of all defects or five per centum on any single defect.

Fourth: "Ungraded." Apples not conforming to the foregoing specifications of grade, or, if conforming, are not branded in accordance therewith, shall be classed as ungraded and so branded. The minimum size of the fruit in the package shall also be branded upon it as hereinafter specified and in addition to the other marks hereinafter required.

The marks indicating grade as above prescribed may be accompanied by any other designation of grade or brand if that designation or brand is not inconsistent with or marked more conspicuously than the one of the said four marks which is used on the said package. Apples packed and branded in accordance with the United States law approved August third, nineteen hundred and twelve, shall be exempt from the provisions of this act.

The minimum size of the fruit in all classes or grades, including the ungraded, shall be determined by taking the transverse diameter of the smallest fruit in the package at right angles to the stem and blossom end. Minimum sizes shall be stated in variations of one-quarter of an inch, like two inches, two and one-quarter inches, two and one-half inches, two and three-quarter inches,

three inches, three and one-quarter inches, and so on, in accordance with the facts.

Minimum sizes may be designated by figures instead of words. The word "minimum" may be designated by using the abbreviation "min."

A tolerance or variation of five per centum on size shall be allowed in all classes, but such five per centum shall not be in addition to the variations or tolerances for defects provided in grades "Fancy," "A" and "B."

(A) Every closed package containing apples grown in the state of New York which is sold, offered or exposed for sale, or packed for sale, or transported for sale by any person shall bear upon the outside of one end in plain letters and figures the name and address of the packer or the person by whose authority the apples were packed and the package marked, the true name of the variety, the grade or class of the apples therein contained and the minimum size of the fruit in the packages. If the true name of the variety shall not be known to the packer or the person by whose authority the package is packed or branded, then such variety shall be designated as "unknown." Every package of apples which is repacked shall bear the name and address of the repacker or the name of the person by whose authority it is repacked in place of that of the original packer.

(B) The marks or brands as prescribed by this act shall be in block letters and figures of size of not less than thirty-six point Gothic.

(C) It shall be unlawful for any person within the state to sell, offer or expose for sale, or pack for sale, or transport for sale apples which are adulterated or misbranded within the meaning of this act.

(D) For the purposes of this act apples packed in a closed package shall be deemed to be misbranded.

First. If the package shall fail to bear the statements required by this act.

Second. If the package shall be falsely branded or shall bear any statement, design or device regarding such apples which is false or misleading, or if the package bears any statement, design, or device, indicating that the apples contained therein are a given New York "standard grade" and said apples when packed or repacked do not conform to the requirements of such grade.

(E) For the purposes of this act apples packed in closed packages shall be deemed to be adulterated if their quality or grade when packed or repacked does not conform to the marks upon the package.

(F) Any person who misbrands or adulterates apples within the meaning of this act, or who violates any of the provisions of this act shall, upon conviction thereof, forfeit and pay to the people of the state of New York a sum of not less than twenty-five dollars nor more than fifty dollars for the first violation and not less than fifty dollars nor more than one hundred dollars for each subsequent violation.

(G) No person shall be prosecuted under the provisions of this act when he can establish satisfactory evidence to the effect that he was not a party to the packing and grading of such articles and had no knowledge that the same were misbranded or illegally packed, or when he can establish a guaranty, signed by the person from whom he received such articles, to the effect that the same are not adulterated or misbranded within the meaning of this act. Said guaranty, or said satisfactory evidence, to afford protection, shall contain the true name and address of the party or parties from whom said articles were received, or who made the sale or shipment of such articles to such person.

(H) Definitions. The word "person" as used herein shall be construed to include both the singular and plural, individuals, corporations, copartnerships, companies, societies and associations. The act, omission or failure of any officer, agent, servant or employee acting within the scope of his employment or office shall be deemed the act, omission or failure of the principal. The words "closed package" shall mean a box, barrel or other package, the contents of which cannot be seen or inspected when such package is closed.

(I) No person shall on behalf of any other person pack any apples for sale or transportation contrary to the provisions of this act.

(J) This act shall not apply to apples actually transported in barrels to storage within this state until the same are sold, offered or exposed for sale, packed for sale, or transported for sale. Regulations and requirements herein in relation to transportation shall not apply to common carriers.

§ 2. Chapter four hundred and eighteen of the laws of nineteen hundred and fourteen, entitled "An act to regulate the

grading, packing, marking, shipping and sale of apples," is hereby repealed.

§ 3. This act shall take effect July first, nineteen hundred and fifteen.

APPLICATION OF THE LAW

This law applies to all apples grown in the state of New York and packed in closed packages for sale.

INTERPRETATION OF TERMS

New York Standard Fancy Grade

"Well grown specimens."— They must be mature, but not over-ripe.

"Properly packed."— The package itself must be standard in size and neat in appearance. The fruit should be properly stemmed and tailed. The specimens should be packed firmly but not bruised. That the quality may be maintained, it is desirable that a flexible cushion be placed between the fruit and the cover.

"Normal shape."— Characteristic shape of the variety.

"Good color."— Color as interpreted by this department refers to the amount and not the shade. For a few common varieties the minimum allowance of amount constituting "good color" is given. The red varieties, such as Baldwin, Tompkins King, Northern Spy, Esopus (Spitzenburg), Jonathan, McIntosh, Ben Davis, Sutton, Alexander, Wealthy, Fameuse, and the like, must have 75 per cent of the surface covered.

Varieties having slightly less color than the above, such as Hubbardston, Gravenstein, Rome, Oldenburg, Wagener, and the like, must have at least 60 per cent of the surface colored with some shade of red.

Varieties of still less color, such as Maiden Blush, Winter Banana, and the like, must have at least 10 per cent of the surface colored with some shade of red.

Yellow or green varieties, such as Rhode Island, Grimes, Yellow Newtown, and the like, must have the characteristic color of the variety.

New York Standard A Grade

"Well grown specimens."— They must be mature, but not over-ripe.

"Properly packed."— The package itself must be standard in size and neat in appearance. The fruit should be properly

NOTE.— For representative specimens of the varieties and descriptions thereof, the packer is referred to "The Apples of New York," which is standard.

stemmed and tailed. The specimens should be packed firmly but not bruised. That the quality may be maintained, it is desirable that a flexible cushion be placed between the fruit and the cover.

“Normal shape.”—Characteristic shape of the variety.

“Practically free.”—Means that apples having small defects, so few in number as not to injure the appearance or keeping quality of the fruit, are allowed in this grade. These defects are allowed in addition to the tolerance percentage.

“Thirty-three and one-third per centum of good color.”—Means that all apples within the package must show at least one-third the amount of color required in New York Standard Fancy grade, as outlined on page 674. For example, the red varieties mentioned above must have one-third of 75 per cent, or 25 per cent, of the surface covered, and so on.

New York Standard B Grade

“Properly packed.”—The package itself must be standard in size and neat in appearance. The fruit should be properly stemmed and tailed. The specimens should be packed firmly but not bruised. That the quality may be maintained, it is desirable that a flexible cushion be placed between the fruit and the cover.

“Practically normal shape.”—Apples slightly irregular in shape may be included.

“Practically free.”—Means that apples having small defects, so few in number as not to injure the appearance or keeping quality of the fruit, are allowed in this grade. These defects are allowed in addition to the tolerance percentage.

Ungraded

Apples marked ungraded are not a New York Standard Grade, and closed packages marked “ungraded” can be packed in any manner that the owners or persons responsible for the packing desire. They must also be marked in addition to the word “ungraded” with the name and address of the packer, the name of the variety and the minimum size of the apples contained therein.

BRANDING OF CLOSED PACKAGES

The following statements must appear upon closed packages of New York Standard Grade apples, packed under the provisions of this law:

1. The name and address of the packer.
2. The word or letter indicating the grade of apples packed within the package and associated with the words "New York Standard Grade."
3. The name of the variety. If variety is not known, the package should be marked "Unknown."
4. The minimum size of the apples packed within the packages. The word "minimum" must be used, or the abbreviation "min.," together with the figures indicating the diameter of the smallest fruit in the package, and not more than five per cent of the total quantity of fruit within the closed package can be below the size marked upon the package.

The above required statements must appear upon the outside of one end of the package. They may be branded or stenciled thereon, or pasters bearing such may be used. These statements must be in block letters and figures in type the size of thirty-six point Gothic or larger.

36 PT. GOTHIC

The following are samples of markings, one of which should appear on all closed barrels or closed packages of apples grown and packed for sale in the State of New York:

NEW YORK STANDARD FANCY GRADE

MIN. 2-INCH BALDWIN

JOHN JONES, ALBANY, N. Y.

NEW YORK STANDARD A GRADE

MIN. 2-INCH BALDWIN

JOHN JONES, ALBANY, N. Y.

NEW YORK STANDARD B GRADE

MIN. 2-INCH BALDWIN

JOHN JONES, ALBANY, N. Y.

UNGRADED MIN. 2-INCH BALDWIN

JOHN JONES, ALBANY, N. Y.

PERCENTAGE OF TOLERANCE

Percentage of tolerance refers to total quantity and may be expressed or computed in terms of quarts or weights.

STORING OF APPLES

Closed packages of apples can be transported to storages within the state for storage without marking them, but such closed packages of apples must be graded, packed and marked in a way to comply with the law before they are removed in closed packages from the storage for sale or transportation for sale.

CLOSED PACKAGES

“Closed packages” means all double-headed or burlap-covered barrels, boxes, baskets or other packages, the contents of which cannot be seen when closed.

REPACKING OF CLOSED PACKAGES

Any person responsible for the repacking in New York State of closed packages of apples for sale, that were grown, packed, and branded in New York State, must erase the name and address of the original packer and substitute his own. Apples not raised in New York State cannot be branded as New York State apples. (See second clause under Subdivision D, bottom of page 672.)

The New York Standard apple barrel is of the following measurements and capacity: Head $17\frac{1}{8}$ inches, stave $28\frac{1}{2}$ inches long, capacity 7,056 cubic inches, bilge 64 inches outside measurements, distance between heads 26 inches.

VIOLATIONS OF THE LAW

If closed packages of apples not properly branded — or, if branded, and the contents do not conform to the marks branded upon the package within the limits of tolerance — are sold, offered or exposed for sale, packed for sale, or transported for sale, the owner or person responsible for packing or branding such apples violates the law, and is subject to such penalties as are provided in Subdivision F. (See page 673.)

UNITED STATES APPLE GRADING LAW

Apples packed and branded in accordance with the United States Law, approved August 3, 1912, do not have to be branded or graded in accordance with the New York State Apple Grading Law. A copy of the United States law follows:

[Public — No. 252.]

[H. R. 21480.]

An Act To establish a standard barrel and standard grades for apples when packed in barrels, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the standard barrel for apples shall be of the following dimensions when measured without distention of its parts: Length of stave, twenty-eight and one-half inches; diameter of head, seventeen and one-eighth inches; distance between heads, twenty-six inches; circumference of bulge, sixty-four inches outside measurement, representing as nearly as possible seven thousand and fifty-six cubic inches: *Provided*, That steel barrels containing the interior dimensions provided for in this section shall be construed as a compliance therewith.

SEC. 2. That the standard grades for apples when packed in barrels which shall be shipped or delivered for shipment in interstate or foreign commerce, or which shall be sold or offered for sale within the District of Columbia or the Territories of the United States shall be as follows: Apples of one variety, which are well-grown specimens, hand picked, of good color for the variety, normal shape, practically free from insect and fungous injury, bruises, and other defects, except such as are necessarily caused in the operation of packing, or apples of one variety which are not more than ten per centum below the foregoing specifications shall be "Standard grade minimum size two and one-half inches," if the minimum size of the apples is two and one-half inches in transverse diameter; "Standard grade minimum size two and one-fourth inches," if the minimum size of the apples is two and one-fourth inches in transverse diameter; or "Standard grade minimum size two inches," if the minimum size of the apples is two inches in transverse diameter.

SEC. 3. That the barrels in which apples are packed in accordance with the provision of this Act may be branded in accordance with section two of this Act.

SEC. 4. That all barrels packed with apples shall be deemed to be below standard if the barrel bears any statement, design, or device indicating that the barrel is a standard barrel of apples, as herein defined, and the capacity of the barrel is less than the capacity prescribed by section one of this Act, unless the barrel shall be plainly marked on end and side with words or figures showing the fractional relation which the actual capacity of the barrel bears to the capacity prescribed by section one of this Act. The marking required by this paragraph shall be in block letters of size not less than seventy-two point one-inch gothic.

SEC. 5. That barrels packed with apples shall be deemed to be misbranded within the meaning of this Act—

First. If the barrel bears any statement, design, or device indicating that the apples contained therein are "Standard" grade and the apples when packed do not conform to the requirements prescribed by section two of this Act.

Second. If the barrel bears any statement, design, or device indicating that the apples contained therein are "Standard" grade and the barrel fails to bear also a statement of the name of the variety, the name of the locality where grown, and the name of the packer or the person by whose authority the apples were packed and the barrel marked.

SEC. 6. That any person, firm or corporation, or association who shall knowingly pack or cause to be packed apples in barrels or who shall knowingly sell or offer for sale such barrels in violation of the provisions of this Act shall be liable to a penalty of one dollar and costs for each such barrel so sold or offered for sale, to be recovered at the suit of the United States in any court of the United States having jurisdiction.

SEC. 7. That this Act shall be in force and effect from and after the first day of July, nineteen hundred and thirteen.

Approved, August 3, 1912.

THE APPLE-PACKING TRAIN

F. S. WELSH, New York City

Agriculturist, New York Central Railroad



When the New York apple grading law was amended by the legislature of 1914-15, it seemed desirable that something should be done to acquaint growers and shippers with the changes that had been made, and, with the requirements of the new law.

After consultation with a number of men interested in the apple industry, it was decided that an effort should be made in this direction by means of an apple packing demonstration train to be op-

erated by the New York Central railroad in cooperation with the State Department of Agriculture. A schedule was arranged which would take the train to the important apple-producing sections of the state, and exhibits were planned to illustrate clearly the meaning of the law and to carry information regarding the various phases of apple packing.

The train consisted of three cars. A baggage car carried barrels of fruit properly packed and labeled, closed packages, stencils, and models of mechanical graders of various types. The exhibits were so arranged that they could be easily inspected by visitors, who would also have an opportunity to talk at length with attendants in the car.

The second car was equipped as a lecture hall, with an especially designed screen for showing slides and charts by means of a stereopticon lantern. This car, with seats for approximately one hundred people, also carried a case of models and a series of colored illustrations showing the color requirements for different varieties according to the grades established by the law.

The third car furnished sleeping and living accommodations for the attendants, who were to make this their home during the three weeks' trip of the train, from August 2 to August 22.

The New York State Department of Agriculture was represented by Messrs. B. D. Van Buren, William Hotaling, and G. F. Wheaton. Professor H. B. Knapp of the Department of Pomology, State College of Agriculture, was also secured by the department to accompany the train, which was in charge of the writer.

The train made stops of from two to three and one-half hours at each station, the cars being located as conveniently as possible to the New York Central passenger stations.

When the cars were opened for visitors, a period of about thirty minutes was allowed for inspection of the mechanical graders and for questioning the attendants regarding the exhibits. After this a meeting was called in the assembly car, where Professor Knapp discussed the text of the apple grading law, emphasizing



FIG. 173.—APPLE PACKING—TRAIN, AND MEN WHO GAVE ADVICE TO APPLE PACKERS

the important changes in the grades from the preceding year, and the fact that the law is now a part of the agricultural law, and that, therefore, the Commissioner of Agriculture had greater powers in securing its enforcement than had previously been the case.

After Professor Knapp had explained the requirements of the present law, Mr. Van Buren, as a representative of the Commissioner of Agriculture, explained the interpretations which had been made with reference to various terms of the law. Mr. Van Buren explained that the department would consider "closed

packages" to mean "all double-headed or burlap-covered barrels, boxes, baskets, or other packages, the contents of which could not be seen when closed," and he illustrated from the case of models and by charts what would be considered as "good color" for the various varieties. Other terms of the law, such as "well grown specimens," "properly packed," "normal shape," and "practically free" from insect and fungus injury, were also illustrated by models or actual specimens of fruit.

Following a question box on the matters emphasized by Professor Knapp and Mr. Van Buren, another phase of the apple packing question was discussed; namely, the possibility of central packing houses in securing better packing, a more uniform pack, and facilitating marketing.* The writer, of the New York Central railroad, who had spent some time in gathering information as to the methods of operation of central packing houses in the eastern part of the United States and in Canada, where a compulsory apple packing law exists, presented this matter and illustrated his remarks by a series of lantern slides.

† Prof. Knapp followed with a series of lantern slides showing monthly receipts of apples on the New York markets, covering a period of twenty years, and the average prices of different varieties by months over the same period, and drew some interesting conclusions as to the most profitable varieties for storage and the most desirable time for selling these varieties. He also compared the export of apples of Canada and the United States and pointed out the distribution of export apples to the various foreign countries, together with the varieties preferred in these countries.

One of the most interesting slides showed the result of inquiries sent out to produce men in all sections of the United States, requesting information as to sources of supply, or the states from which they drew their apples. The replies showed that the number of dealers preferring New York apples was more than double the number of those that expressed a preference for apples from other districts. Professor Knapp argued from these figures that, with the proper packing and grading of New York apples, growers would have little to fear from competition in other districts more remote from the great markets of the East.

* See article on central packing houses, page 895.

† See article by Prof. Knapp, page 927.

During and following these discussions in the assembly car, Mr. Wheaton and Mr. Hotaling were in consultation in the exhibit coach with growers who had special problems upon which they desired information. The opportunity to discuss these matters of special personal interest with the attendants proved to be one of the most valuable features of the train. Growers who were uncertain as to how to pack hail-marked apples, or as to the grade in which apples with minor defects should be placed, received definite and first-hand information on these points, and did actual grading of fruit under the direction of these representatives of the State Department of Agriculture.

A noticeable result of the operation of the train was that many growers, who were at first somewhat puzzled as to the requirements, found that the complexity of the law was not nearly so great as they had thought, and became strong advocates of the measure which they formerly had felt was burdensome. When once it was seen that the law was practicable, and designed to minimize dishonest packing practices which bring New York apples into bad repute, growers heartily endorsed the law as a necessary and desirable step in protecting the reputation of New York State apples and in insuring the continuance of conditions that will make it possible to grow them profitably.

An inquiry relating to the quantity of apples stored in the coolers this year has been completed by the Office of Markets and Rural Organization, Washington, D. C. The number of storages responding to the inquiry is an increase of 62 over the number reporting on December 1, 1914, and an increase of 45 over the largest number reporting for any month during last season's investigation.

Information was also secured as to the amounts of apples held in cold storage on December 1, 1914, in order that the conditions this year may be compared with those existing at the opening of the cold storage season last year.

Three hundred and fifty-one firms, having a storage capacity of 8,056,365 barrels, reported their holdings for December 1, 1915, as the equivalent of 5,399,691 barrels. Of these firms, 339, having an approximate capacity of 7,906,838 barrels, reported the equivalent of 5,332,157 barrels; while on December 1, 1914,

they reported 4,617,331. It would appear, therefore, that there were 15.5 per cent more apples in cold storage on December 1, 1915, than on the same date one year ago.

Of the 351 firms reporting, 230 indicate that of their total holding, 29.24 per cent is subject to the orders of growers.

Sixty-one storages in New York State reported their holdings as follows:

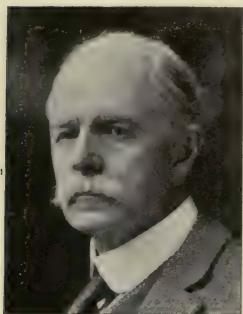
	Dec. 1, 1915	Dec. 1, 1914
Barrels	1,327,231	1,319,251
Boxes	249,313	252,370

Estimating that three boxes are equivalent to one barrel, the report of 1915 indicates an increase of .5 per cent.

INSPECTION WORK OF THE DEPARTMENT OF AGRICULTURE IN RELATION TO HORTICULTURE

DR. GEORGE G. ATWOOD

Chief, Bureau of Plant Industry, New York State Department of Agriculture,
Albany, N. Y.



The present organization of the Bureau of Plant Industry consists of George G. Atwood, Chief; B. D. Van Buren, Assistant Chief; H. C. Sands, Pathologist.

There are twelve inspectors having charge of divisions of the state, located permanently at convenient points for attention to the several requirements of the law. Assistants are given to these inspectors in greater or less number, depending upon the amount of work required at different seasons of the year.

The total number of employees of the bureau at the present time is thirty-six. This includes two stenographers and one copyist and illustrator.

The expenses of the bureau for the last ten years has averaged about fifty thousand dollars per annum.

The practical work of the bureau may be divided into the following heads:

1. Nursery inspection.
2. Shipment inspection.
3. Foreign shipment inspection.
4. Scouting inspection.
5. Orchard work.
6. Pathological inspection and investigation.
7. Inspections under the Apple Grading Law.
8. Insecticides and fungicides.
9. Bee inspection.
10. Miscellaneous.

NURSERY INSPECTION

The inspection of nursery stock was first provided for by the enactment of a law in 1898, at which time there was much alarm among the nurserymen and fruit growers of the state over the discovery of two localities in the state of New York that had become infested with San José scale. Other states were passing laws requiring that all nursery stock shipped into the several states should bear a copy of a certificate of inspection indicating apparent freedom from San José scale. At the beginning of this work practically nothing was known of the extent of the nursery business in the state of New York, neither was there any information relative to the volume of business conducted by the nurserymen with other states. Our first statute on this subject was drawn broad enough to include any contagious or infectious disease or diseases, or the San José scale or other dangerously injurious insect pest or pests, and the act provided that the certificates to be issued to the nurserymen should embrace the idea of apparent freedom from all. The law required the annual inspection of all growing nursery stock in the state of New York, and at the present time it has been found necessary to inspect over ten thousand acres of nursery stock, grown by about six hundred and sixty nurserymen. Some of these nurseries are small, but the law requires that no nursery stock shall be shipped from any point in the state of New York unless there be attached to each box, bundle or package a copy of the certificate of inspection issued by the Commissioner of Agriculture. Transportation companies are forbidden to receive any nursery stock for shipment unless accompanied by said copy of certificate.

SHIPMENT INSPECTION

An amendment to the law was made in 1910 for two reasons: (1) The inspection authorities of the state of Massachusetts announced that they would not commit themselves in their certificates of inspection to nurserymen or give any assurance that the nursery stock shipped from Massachusetts would be free from egg masses of the gipsy moth, the reason given being that the winter form of this injurious insect was so obscure that certain evergreen trees on which the egg masses are located could not be adequately inspected; (2) the same year consternation

prevailed among the nurserymen of the state, owing to the fact that shipments of nursery seedlings and stocks from abroad were arriving in this state badly infested by the winter nests of brown-tail moth.

Neither of these pests have become established in the state of New York, and extreme measures were taken to prevent their coming and to avoid their distribution. The amendment of the law provided that all nursery stock coming into the state should be examined at point of destination. To carry out this provision, the Commissioner of Agriculture was authorized to issue orders relative to injurious insect control and the control of deleterious fungous diseases of trees and plants. Under this authority he issued orders requiring all persons who received nursery stock from points outside of the state of New York to hold them unpacked and unopened until an inspector could be present to examine the shipments. This work has been followed up to the extent of an examination of about eight thousand shipments a year. This particular line of work is rather expensive, though it has been justified many times by the discovery of infested stocks of trees and plants which surely would have caused the establishment of deleterious pests within our borders. It may seem unnecessary to go so far as to examine small packages of nursery stock, but it is through the careless introduction of small packages that great injury may accrue.

Owing to the short time during which nursery shipments are received in the state, it is not strange that occasionally some packages may be overlooked. In two cases this has occurred, and the eggs of the gipsy moth were brought into the state of New York and became established in limited localities. In one case the cost of eradication may have been as much as five thousand dollars; and in another case, where the gipsy moth had a little longer time to spread in the wild and mountainous regions of Westchester County, the expense of suppression may have been twenty-five thousand dollars. These expenditures were justified on the ground that, inasmuch as this pest had not become established within the state, every effort should be exerted to stamp it out at the very beginning of its development. When one considers that the New England states spent upwards of ten millions of dollars for the control of the gipsy and brown-tail moths, it

would seem that no criticism could arise upon our attempting to eliminate the very first outbreak. The inspection of shipments coming into this state indicate that the longer the law is enforced the more satisfactory is the nursery stock received, on account of the remarkable freedom from insects and diseases.

FOREIGN SHIPMENT INSPECTION

Closely related to the shipment inspection above indicated, the examination of about four thousand shipments of foreign nursery stock annually has led to the same general satisfactory results as indicated in the movement of nursery stock from other states into this. The brown-tail moth, though found in shipments from France during two years, has not become established in the state through shipments of nursery stock. A small outbreak of brown-tail moths on the extreme eastern end of Long Island was undoubtedly caused by being wind-spread from states north of the Sound.

We occasionally find egg masses of the gipsy moth on azaleas coming from Belgium and other foreign countries. The gipsy and brown-tail moths are two particular insects requiring attention, though there are several others which are occasionally found, and, when new to the state, special efforts are made to prevent their becoming established. Notable among the insects is a new pine-shoot moth, which destroys the terminal growth and would be very injurious to the development of trees for forestry planting. This insect is known at only seven points in the state, and annual inspections are made to see that it does not spread.

SCOUTING INSPECTION

The permanent phase of the work under this heading is the attention given, during the winter and other seasons when nursery shipment inspections are not urgent, to canvassing with great care the sections of the state where a possibility exists of infestation of gipsy moth — especially along the New England borders of the state — to locate if possible any hidden outbreak of gipsy or brown-tail moth. It is hoped that by diligence the introduction of the gipsy moth may be prevented for many years to come, owing to the comparatively slow habit of spread of this particularly destructive insect.

On the brown-tail moth we should continue the contest as long as possible, though the time may come when this pest shall come upon us because of its great habit of flight, it having been known to spread many miles in a single season. Prevailing westerly winds may help us to some extent, and we now have hopes that the natural parasitic enemies of this pest may ultimately reduce the danger. Recent developments in New England are to the effect that the brown-tail moth is not largely increasing its habitation there.

Considerable attention is continually given to the plantings made by the park systems of the state, and also to those of the private grounds of large estates wherever extensive plantings have been made of imported trees in the last fifteen years.

ORCHARD WORK

As the inspectors of the department have opportunity from time to time, attention is given to an inspection of orchards in various parts of the state with a view of assisting the owners in the control of dangerously injurious insects and fungous diseases. Since there is no law requiring orchardists to spray their trees, as has been adopted in the western states for the eradication of codling moth and similar insects, our work must be confined to the destructively injurious types.

When the San José scale appeared in 1898, the orchardists themselves were very much alarmed and believed that it would be only a short time before their industry would be exterminated. At that time it was believed that the only remedy for the control of the scale was to have the trees dug out wherever infection was discovered. A few orchards were condemned and destroyed, and it was at least five years later before an adequate remedy was found for the control of San José scale. Formulae used up to that time were more destructive than the scale itself, and the idea became apparent that something must be done to find a remedy and save the fruit as well as the trees. The department decided that no more orchard trees should be destroyed, but that the then so-called lime-sulphur-salt solution should be used, if necessary under compulsory orders of the Commissioner of Agriculture. Since that time the rapid improvement of insecticides

and the remarkable development of spraying apparatus have been sufficient not only to save the trees from the scale insects, but to improve and save the fruit from the attacks of minor pests; and the enormous crops of fruit that are grown in this state at present indicate that the industry has been saved and that the losses feared by the fruit growers have not been realized.

PATHOLOGICAL INSPECTION AND INVESTIGATION

Within the last year the department has been able to give particular attention to such pathological inspection as was made necessary by the discovery of the powdery scab of the potato, a newly imported disease that threatened the potato industry of the state, together with a fear that the wart disease of the potato might be introduced, to the further destruction or injury to the crop. The crop produced annually in this state is valued at fifty millions of dollars and should certainly receive attention — the best that can be given. The work along this line has been extensive and the information collected relative to the importance of potato seed regulation is very convincing. There are at least a half-dozen leading diseases of this important crop, most of which could be controlled under an adequate inspection service.

There are also many other diseases of trees and plants that properly receive attention under our existing laws. The most important of these are the obscure diseases of the peach, the blights and cankers of the fruit trees, the chestnut bark disease, and the growth of bacterial diseases of plants, the scientific investigation of which has quite recently led to interesting and remarkable development.

Foreign countries, and especially those of South America, demand certificates of inspection for vegetable products expected to carry insect or fungous troubles likely to cause loss in their respective areas. At present this applies mainly to potatoes, but indications point to the fact that it very likely will include many others. The government of the Bermuda Islands has gone so far as to require field inspections of the growing plants in the country of origin. These inspections are made in cooperation with a representative of their government sent here for the purpose. This work is fast assuming many varied forms.

APPLE GRADING LAW

No specific appropriation was made for the enforcement of this law; therefore, not to exceed ten inspectors were withdrawn from other duties and have devoted considerable attention to a collection of evidence for violations since the first of September. The burden of this work has been in charge of the Assistant Chief of the Bureau, Mr. B. D. Van Buren, who has prepared an article relative to the work. See page 669.

INSECTICIDES AND FUNGICIDES

Legislation in recent years has had a tendency to improve very largely the chemicals used by our nurserymen and fruit growers for the purpose of exterminating insect pests and preventing the injury from fungous diseases. The law requires manufacturers within the state and dealers in original packages of commodities manufactured outside of the state to file an application with the Commissioner of Agriculture, which application must contain the percentage of essential ingredients to be offered on the market. It is further required that the labels on the packages shall be the same as embodied in the application. This system of labeling enables the purchaser to know what he is buying. Over three thousand of these certificates have been issued. An average of more than one hundred samples a year are collected in the open market and sent as the law requires to the New York Agricultural Experiment Station, where analyses are made and published. The statements made in the application for certificates and labels upon the packages constitute a guarantee to the purchaser as to the quality of insecticides and fungicides offered.

BEE INSPECTION

Bee inspection consists of an attempt to control and eradicate the brood diseases of bees, and is done under an Act passed about twenty years ago, at a time when the eastern counties of the state were threatened with brood diseases to such an extent that the industry of honey production was sadly reduced. At the present time little or no disease appears in the counties where the diseases were most virulent. These diseases appear from time to time, and the keepers of apiaries must be instructed as

to the manipulation of them, but occasionally it is necessary to have colonies destroyed to prevent the spread in local communities. A system of quarantine regulations has been adopted, preventing the selling of diseased colonies which are placed by order of the Commissioner under quarantine regulations for this purpose. One difficult feature of the management of this work is the fact that beekeepers are widely scattered over the state, and, the industry not being an extensive one, the homes of the beekeepers are often many miles from convenient means of communication.

Another duty of bee inspectors is to attend various meetings of the associations of the state and impart such knowledge as they possess relative to the art of beekeeping.

MISCELLANEOUS WORK OF THE BUREAU

In cooperation with another bureau of the *département* it becomes necessary for inspectors of this bureau to examine and report upon orchard conditions, for the benefit and information of purchasers of the farms offered for sale through the department.

The bureau is also called upon to make exhibits at the state and county fairs and other assemblages to inform local organizations relative to the care of their trees.

Shade tree problems of great importance are placed before the bureau and include the question of the control of such insect pests as are injuring the hickory, hemlock, and pine trees in various portions of the state. The blister rust of the pine, the chestnut bark disease and other problems require much attention; and it is believed wherever a request has been made that the department has met the requirements of all applicants and that much local good has been done.

The inspectors of the department are often called upon to attend meetings and deliver addresses on various horticultural topics, including assistance to the farmers' institutes.

The bureau has also done considerable cooperative work with Professor F. C. Stewart, Botanist at New York Agricultural Experiment Station, on pine rust and potato and other plant diseases, and with Dr. Felt, State Entomologist, Professor Parrott,

of the New York Agricultural Experiment Station, and others, in the investigations of intricate entomological problems. Recently, attention has been given to careful studies of the pear psylla, the pear thrips, sinuate pear borer, potato diseases, and other hindrances to the proper development of the horticultural interests of the state.

The bureau has also worked in cooperation with the Superintendent of State Forests in the handling and control of the destructive blister rust of the pine.

As it is becoming more generally known that persons are engaged in the growing of trees in propagating beds or nurseries, or in the park systems on large estates; also on account of the shade tree problems of the municipalities, the work of the bureau is growing rapidly and involves an extensive correspondence, the object of which necessitates its being conducted promptly, giving the best information. If for any reason full and adequate response to correspondents cannot be given, references are made wherever it is possible to get satisfactory answers to inquiries.

In the year 1914, an unprecedented outbreak of grasshoppers appeared in seven counties, principally in the sandy soil sections north and northwest of Albany. Quite late in the season, demonstration measures were conducted on several hundred farms to show the farmers how the use of poison bait would be effective in destroying the grasshoppers and saving the crops. It developed that the work was not begun quite early enough in the season, but many valuable crops were saved and much good was done to the farmers on those light lands.

The same year there was a widespread outbreak of army worm caterpillars, extending from Long Island to Chautauqua county. Considerable attention was given to demonstrating the control methods for this pest. These insects have not appeared to a very destructive extent this year. The outbreak of grasshoppers in Saratoga County and further north began early in the season, and our demonstration work against them was as extensive as our funds would permit, hundreds of farmers receiving assistance in controlling the grasshopper plague. Lesser demonstrations were conducted in other parts of the state, with the result that we are now convinced that if farmers will use the poison

bait carefully, to the extent of a few cents an acre at the right time, the so-called grasshopper plague may be wholly averted.

The library of the department has over sixty thousand index cards relating to horticultural and agricultural matters.

A few bulletins and circulars have been issued from time to time, written with the intention of conveying the idea of control of insect pests and fungous diseases in a form that can be understood by those who are not specially trained in the technical aspects of the case.

The following circulars and bulletins in relation to horticulture are available for distribution:

Horticultural Bulletin No. 2.—Blister Rust of Pines and European Currant Rust.

Department Bulletin No. 41.—Wart Disease of the Potato.

Department Bulletin No. 61.—Peach Yellows and Little Peach.

Circular No. 32.—Law Relating to Insecticides and Fungicides.

Circular No. 58.—Insect Pests, Fungous Diseases and Spray Formulae.

Circular No. 67.—Relating to Fumigation of Bud Sticks and Nursery Stock.

Circular No. 68.—Law Relating to Insects Pests and Fungous Diseases and Nursery Inspection.

Circular No. 64.—Dying Hickory Trees.

Circular No. 97.—Diseases of the Honey Bee and Treatment.

Circular No. 112.—Tent Caterpillar and Control.

Circular No. 113.—Arbor Day, New York State.

Circular No. 118.—New York Standard Apple Grading Law and Information of Interest to Fruit Growers, Dealers and Purchasers.

Circular No. 119.—List of Certified Nurserymen in the State of New York.

Circular No. 120.—Inspection, Certification and Transportation of Nursery Stock, United States, all States and Canada.

Chapter 127, Laws of 1915.—Act Relating to the Sale of Fruit-bearing Trees.

Chapter 217, Laws of 1915.—New York State Apple Grading Law.

HISTORY OF FRUIT EXHIBITS AT STATE FAIR

H. B. KNAPP

Assistant Extension Professor, Department of Pomology, Cornell University,
Ithaca, N. Y.

PIONEER AND ITINERANT PERIOD OF THE STATE FAIR



The First Annual Fair and Cattle Show of the New York State Agricultural Society was held at Syracuse in 1841. At that time much more emphasis was laid upon the animal husbandry and dairy branches of farming than upon the production of fruits, flowers, and vegetables, because of the greater importance of the former in the farming industry of the state. Some space was devoted from the first, however, to the exhibition of fruits, interest in which was just awaken-

ing among farmers of the state. As this interest grew and the culture of fruit assumed the position of a great commercial industry, proportionately greater attention and space was accorded the fruit grower and his products at these fairs.

In the early years of its existence the fair had no permanent home. It was transferred from one city to another throughout the entire state, among these being Albany, Saratoga, Utica, Elmira, Rochester, Buffalo, Auburn, Watertown, and Syracuse. This, of course, meant that no durable structures could be erected in which the exhibition might be staged. As a result, the earlier records of the Fair are replete with descriptions of "floral halls" and "horticultural halls" hastily constructed to meet the needs of the occasion, but beautifully adorned, according to these reports, with flowers, plants, and vines appropriate to the nature of the products on exhibition within them.



FIG. 174.—THE FRUIT EXHIBIT AS IT APPEARED FROM 1895-1910
Note the different tiers of fruit and prominence of labels. Compare with Fig. 179

EARLY PREMIUM LISTS

The first published premium list for fruits appeared in connection with the Fair held at Utica in 1845. It is given below in the original form:

TABLE APPLES

	1ST	2ND	3RD
For the greatest variety of table apples	\$5.00	\$3.00	Vol. Trans.

TABLE PEARS

Greatest variety of table pears.....	\$3.00	Vol. Trans.
--------------------------------------	--------	-------------

WINTER APPLES

Greatest variety of winter apples...	Vol. Trans.
--------------------------------------	-------------

APPLES

Best twelve varieties table apples...	\$3.00
---------------------------------------	--------

QUINCES

Best twelve quinces.....	Vol. Trans.	Vol. Trans.
--------------------------	-------------	-------------

PLUMS

Best twenty-four plums.....	Vol. Trans.
-----------------------------	-------------

GRAPES

Best six bunches native grapes.....	Vol. Trans.
-------------------------------------	-------------

Best six bunches foreign grapes.....	Vol. Trans.
--------------------------------------	-------------

From such a beginning the fruit exhibit has grown until it now embraces nearly 270 classes with annual awards of over \$4,000. In the forties and fifties popular premiums were: a volume of the Transactions of the Society, the Diploma of the Society, and a copy of Downing's "Fruits and Fruit Trees in America." Names often appearing in the early records were those of David Thomas and J. J. Thomas, Ellwanger and Barry, William Kenrick (who brought collections of fruit from his Massachusetts home), Lincoln Fay, Charles Downing, and A. J. Downing. Many of these men established an enduring place for themselves in American pomology. The beginnings of our fruit industry were in able hands.

It is of interest to note that watermelons and muskmelons were listed and awarded premiums under the headings of fruits for a considerable period.

Separate lists and awards for professional and amateur fruit growers were maintained, though the basis of distinction between the two was not made clear. Emphasis was laid upon collections of the different fruits without reference to varieties rather than upon single plates of the different kinds. Apples, pears, and grapes were most prominent in these premium lists. Premiums were also offered for seedling fruits, but the judges possessed sufficient courage to withhold awards in many cases on the



FIG. 175.—THE GRANGE EXHIBIT THAT WON FIRST PRIZE IN 1912

grounds of lack of merit. No variety names were mentioned until 1876, when Ellwanger and Barry received a prize of \$2.00 for a plate of "Apple or Orange quinces." In 1877 a new section entitled, "Single Dishes, Open to All," was added and a prize of \$2.00 was given for plates, or dishes, of the following varieties of apples, pears, and grapes: Baldwin, King of Tompkins County, Northern Spy, Rhode Island Greening, Roxbury Russet, Twenty Ounce, Esopus Spitzenburg, Red Canada; Bartlett, Beurre d'Anjou, Beurre Clairgeau, Beurre Bosc, Duchesse

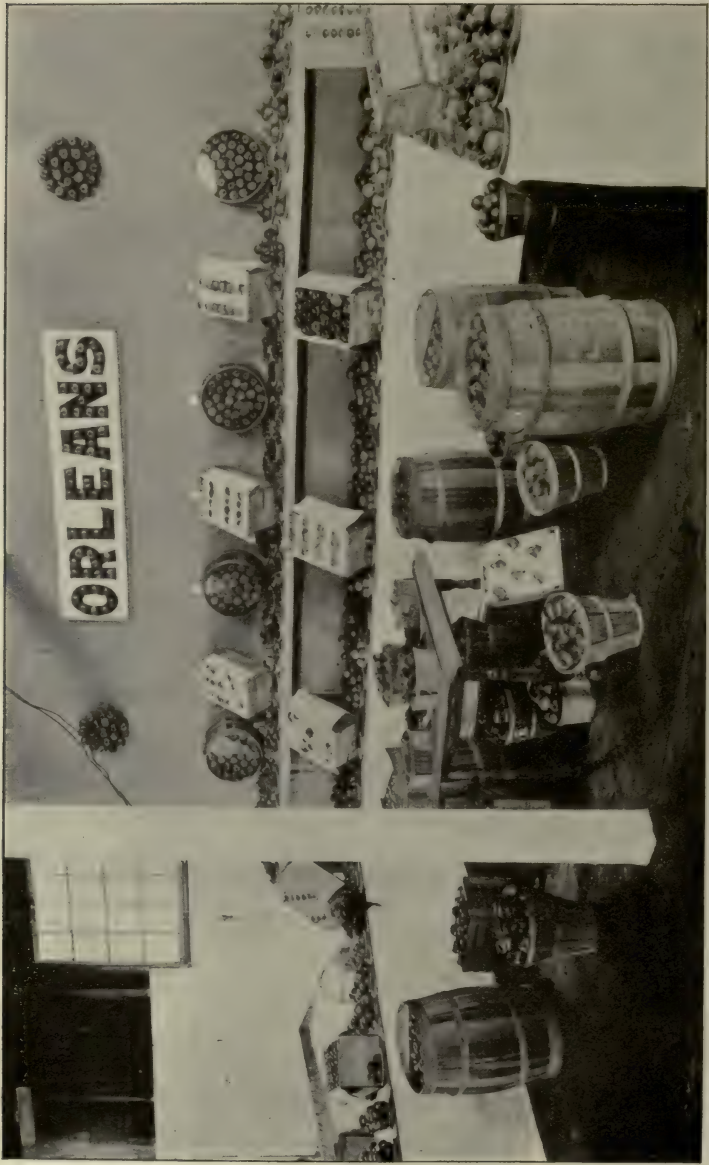


FIG. 176.—ONE OF THE EARLY COUNTY EXHIBITS

d'Angouleme, Doyenne Boussock, Flemish Beauty, Seckel, Sheldon, Lawrence, Winter Nelis; Concord, Catawba, Delaware, Hartford, Isabella, and any of Rogers' varieties. Twelve specimens of apples and pears and six bunches of grapes constituted a dish.

THE STATE FAIR IN A PERMANENT HOME

The first fair that was held upon the present grounds at Syracuse occurred in 1890. There were not sufficient buildings to accommodate all the exhibits of farm and garden, and during 1890, 1891, and 1892 the fruit was displayed in tents, leased

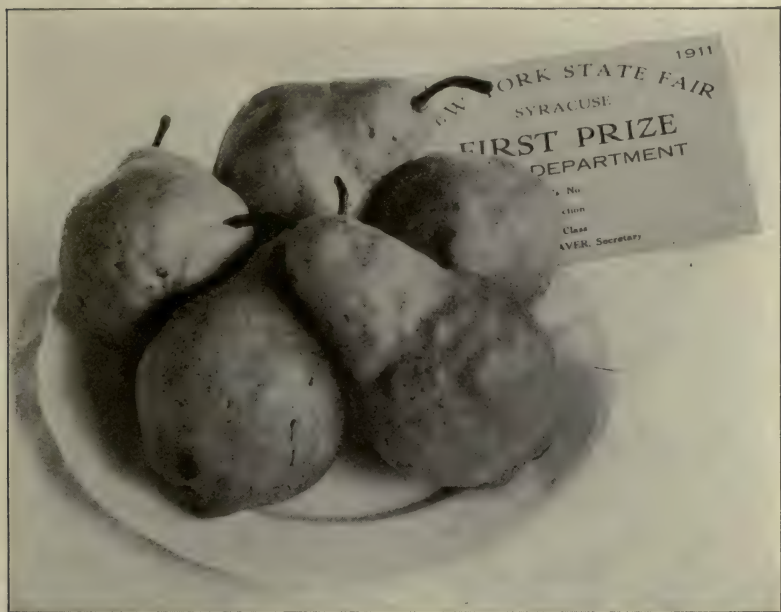


FIG. 177.—THE FIRST PRIZE PLATE OF BARTLETT PEARS IN 1911

and erected for the purpose. The Executive Board made the following report of the display in 1891:

"An especial effort was made to secure a large exhibit of fruit, and so successful was the effort that the officers in charge were overwhelmed by the largest and greatest show of fruit probably ever made in the United States. The need of a permanent building in which to place the fruit on exhibition was sorely felt, and the expense of this department in leasing tents,

erecting platforms, etc., undoubtedly cost the society four-fold more than would have resulted from the interest on a sum necessary to pay for the structure."

In 1892, on the night of September 13, a violent storm blew down nearly every tent on the grounds and practically destroyed the exhibit of fruit and flowers.

The following year, 1893, the legislature appropriated a building fund sufficient to erect, among other structures, the horti-



FIG. 178.—THE FIRST PRIZE PLATE OF ELBERTA PEACHES IN 1911

cultural hall, familiar to present day fair-goers. But the time was to come when Horticultural Hall, once so spacious and adequate, would fail to care for the ever increasing quantity of fruits from the growers of the state. In 1915 the fruit exhibit was transferred from its former home to the north end of the Manufacturers' Building. The floral exhibit was also transferred to the same place, but the change did not prove altogether satisfactory, owing to lack of space in which to display these products to advantage. It is to be hoped that horticulture may soon have

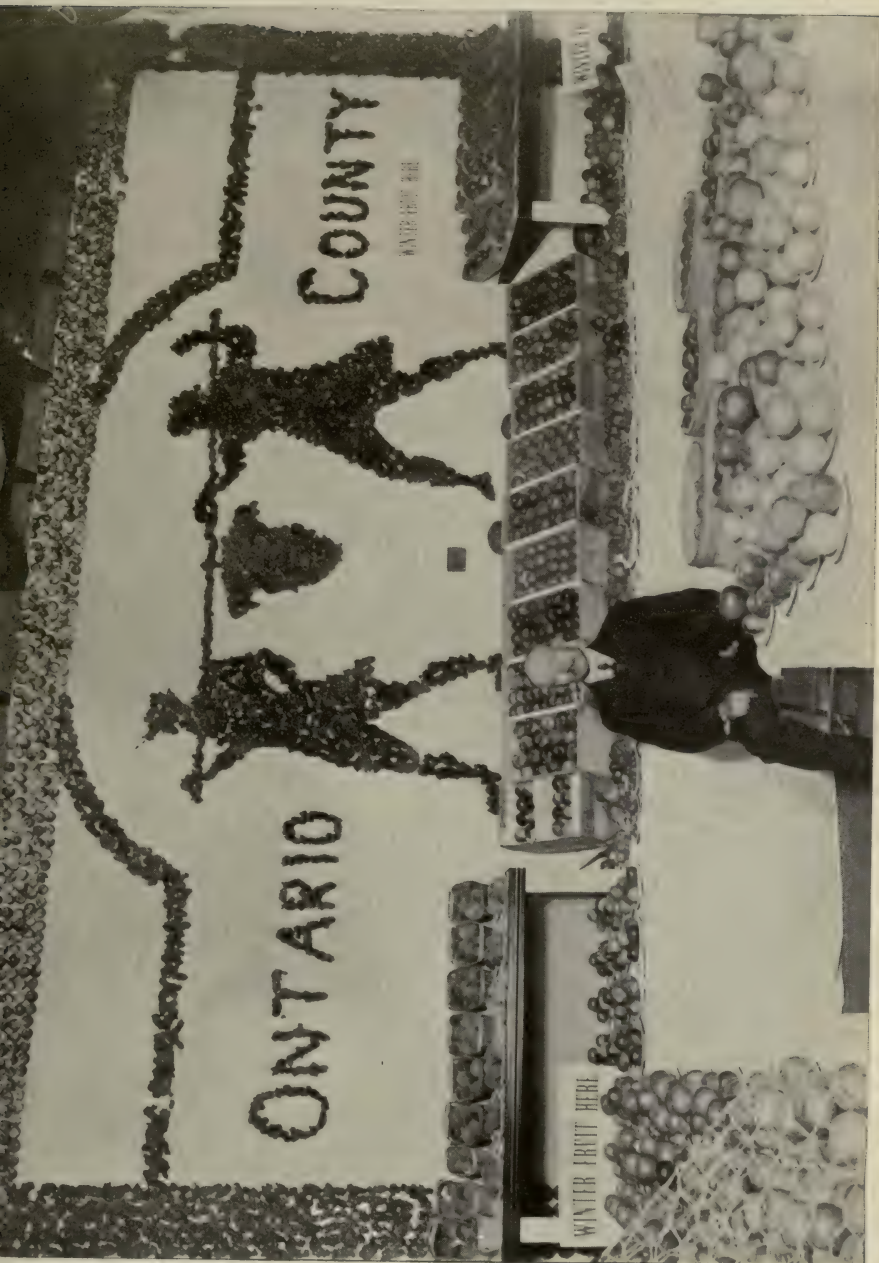


FIG. 179.—AN ONTARIO COUNTY EXHIBIT THAT ATTRACTED MUCH ATTENTION IN 1911. MR. A. B. KATKAMIER IN CHARGE

a home on the fair grounds that is worthy of the position it holds in the farming industry of the Empire State.

COLLECTIVE EXHIBITS

From the year 1890 the importance of the fruit exhibit has grown with leaps and bounds in quantity, quality, and the variety and amount of premiums offered. In 1891 a class was included for the first time for "the largest and best collection of all fruits especially designed for family purposes, collected and exhibited by any society or organization which has been in existence for at least one year." The Central New York Horticultural Society received first prize of \$200, the Western New York Horticultural Society received \$100, or second prize, and a special award of \$50 was made to the Orange County Agricultural Society in view of the excellence of its exhibit. Similar premiums were offered for collections especially designed for market purposes. In 1892 the conditions were changed to some extent, and premiums were awarded for the largest and best collection of fruit grown in the state of New York, collected and exhibited by any society or organization which had been in existence at least one year, without reference to any special purpose or use to which the fruit might be devoted.

Within the past few years the exhibits by the state horticultural societies have given place to displays by counties, for which premiums of \$250, \$200, and \$150 are awarded for first, second, and third places. Ontario, Orleans, and Oswego counties have been represented by such exhibits for a number of years, and in 1915 the counties of Ulster and Niagara entered the lists, the former carrying off first prize. Grange exhibits have also been gradually assuming a more important place. Probably the greatest departure from the custom of early years has been the formation of classes for fruit packed in the form in which it appears upon the market. Packed barrels of apples, boxes of both apples and pears, carriers of peaches, and parcel post packages of all kinds of fruit are shown in ever increasing numbers.

EDUCATIONAL EXHIBITS BY THE STATE EXPERIMENT STATION

The exhibit of the New York State Agricultural Experiment Station, at Geneva, received special commendation at the hands

of the judge, J. S. Woodward, in 1893. It consisted of the following number of varieties: apple, 102; pear, 24; plum, 34; peach, 21; quince, 4; grapes, 125. The splendid display made by this institution has never ceased to attract attention in recent years, and it is altogether probable that this forms the most pleasing single feature in the exhibit room.

PROMINENCE OF SINGLE PLATE EXHIBITS

In 1894, 1133 entries of fruit were made. Plums were admitted to the single plate classes in 1895, and peaches soon



FIG. 180.—THE ULSTER COUNTY EXHIBIT—WINNER OF FIRST PRIZE IN 1915

followed. At present the single plate entries made by growers all over the state receive more prominence than large collections exhibited by a few men. This is as it should be, since it offers the greatest encouragement to the greatest number and gives the small grower, as well as the large one, a chance.

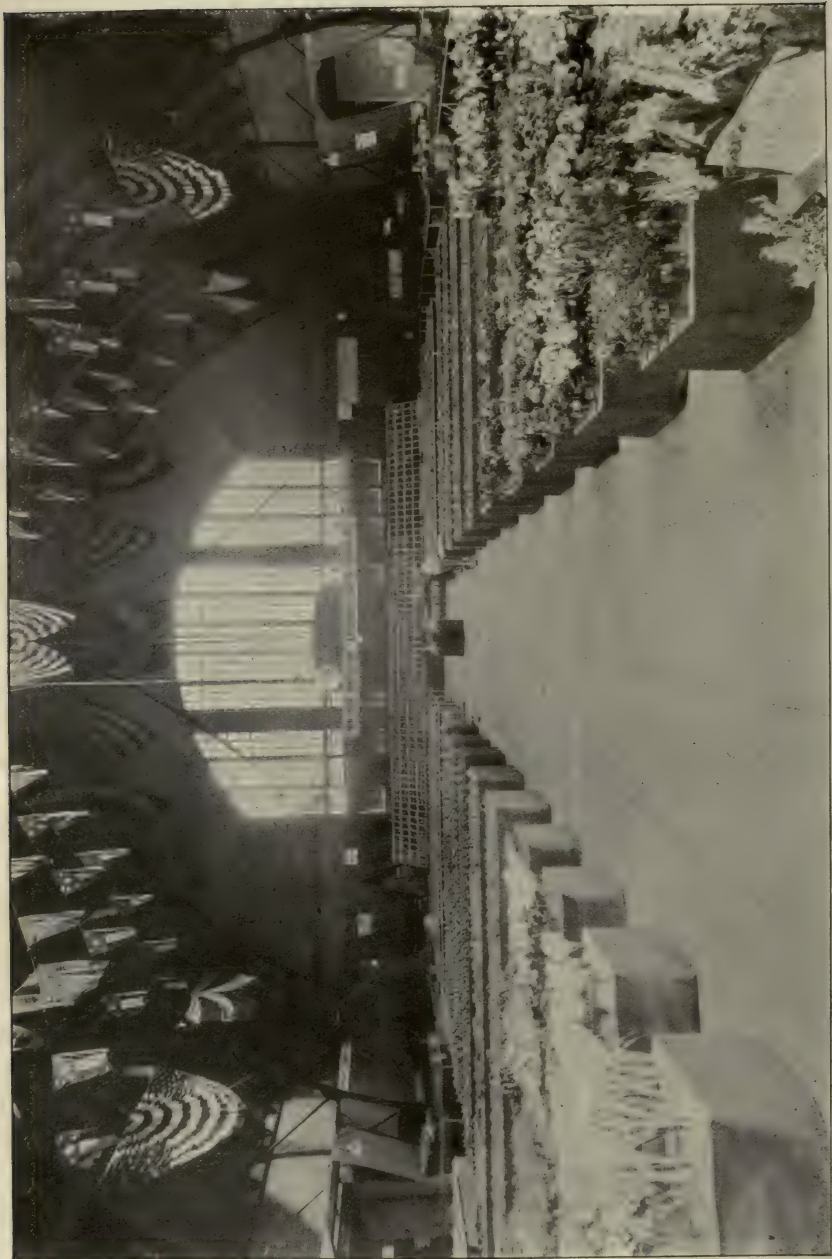


FIG. 179.—THE FRUIT EXHIBIT IN THE MANUFACTURERS' BUILDING IN 1915 WITH A PART OF THE FLORAL EXHIBIT IN THE FOREGROUND

EXHIBITS BY YOUNG PEOPLE

Lastly, the boys and girls, the future fruit growers and farmers of the state, have not been neglected. A special section is provided for them, in which they can contest their skill in selecting and arranging collections of orchard products. It is probable that no expenditure by the Fair Commission is made for a more worthy purpose, or returns in the long run a larger measure of interest and value, than this outlay for the rural schools and their boys and girls.

VALUE TO THE STATE

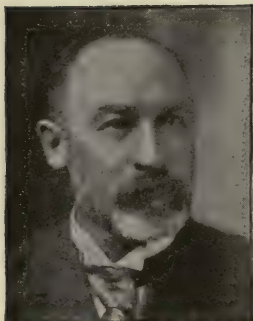
It is difficult to estimate in concrete terms what all this means to the state. New York fruit growers have never been prone to do much talking about themselves or to boom the industry in which they are engaged. The exhibit at the State Fair serves in a modest way to remind the general public that this state possesses a fruit industry that is worthy of her reputation and achievement. There can be no question that the exhibit is worth while to the fruit growers themselves in many ways. The exhibit at the fair has become an accurate reflection of fruit-growing conditions in the state at large. With the possibility of a new and better building before us, with the prospect of fairer methods of packing and saner methods of marketing, both the exhibit at the fair and the industry in the state face a future full of promise.

HORTICULTURAL EXHIBITS AND WHAT THEY MEAN TO THE FRUIT INTERESTS OF THE STATE OF NEW YORK

EXHIBIT OF NEW YORK FRUIT AT THE COLUMBIAN EXPOSITION

EDWARD VAN ALSTYNE

Director of Farmers' Institutes



The first world-wide exhibit of New York's fruits was made at the Columbian Exposition at Chicago in 1893. It occupied 200,000 square feet in the Horticultural Building. The exhibit was divided into three parts — Floriculture, Pomology and Viticulture. In this connection we are concerned with the two last.

The pomological exhibit showed all the fruit of the state, and was in charge of Mr. Geo. T. Powell, of Ghent, Columbia

County, he being at that time Director of Farmers' Institutes. Nearly 3,000 square feet was occupied by this exhibit. From the opening of the exposition until its close the space was well filled with the various fruits of the state, a considerable quantity having been put in cold storage the previous fall. On May 11 there were before the judges 101 varieties of apples and five of pears. From the ripening of the first strawberries there was a continual supply of fresh fruits direct from the growers. For the first time a demonstration was made to the world that, with the exception of citrus fruits, New York produced more fruit than all the other states put together.

The viticultural exhibit was in charge of Mr. Geo. C. Snow of Penn Yan, Yates County. This contained all the wine products of the grape, the fruit being shown with the pomological exhibit. Beginning with grapes held in cold storage, there were Catawbas, Dianas and Isabellas on the tables from May 1 to November 1. The first of the crop of 1893 began to arrive August 15, being Champions from the vineyards of Mr. W. D. Barnes of Middle Hope, Orange County.

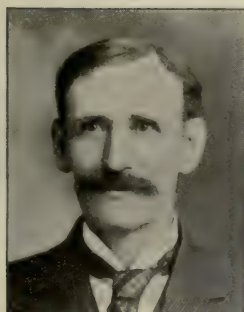
This display was a revelation to thousands who had little idea of the extent and excellence of New York's vineyard products or the money value of the grape crop of our state, which is greater than that of California. There was also an exhibit showing the best methods of handling and trimming the crop. The viticultural exhibition received 22 awards.

In the dome of the Horticultural Building, Dr. Charles H. Peck, State Botanist, showed the edible fungi of the state, in a space occupying 240 feet.

NEW YORK FRUIT AT THE PAN-AMERICAN EXPOSITION IN 1901

F. E. DAWLEY, FAYETTEVILLE, N. Y.,

Assistant Superintendent of Fruit Exhibit at Buffalo



One of the most complete and the largest exhibition of New York state fruits and fruit products that has ever been brought together was made at the Pan-American Exposition in 1901.

The apple crop of 1900 was one of the finest ever grown in the state, and, through having a very wide acquaintance among both professional and amateur apple growers, the superintendents were able to secure a large collection of apples of remarkable quality for the exhibit of cold storage fruit.

The exhibit was made to demonstrate not only that New York could grow the finest fruits, but to show that some localities are better adapted to growing certain varieties; and, while this adaptation is marked in most sorts, the display of sixty-one plates of Baldwins from each county and New York City, which was kept up throughout the exposition, was the leading feature of this portion of the exhibit.

A careful record was made of the number of apples of each variety placed in cold storage, and an accurate account kept of the condition of each of the specimens taken out. This gave some very interesting and valuable data as to the comparative keeping quality of the different varieties, also information as to the effect of early and late picking and some information of value regarding keeping quality in different localities.

The exhibit of cold storage apples grown in 1900 was placed on the table, May 20. It comprised over 4,000 plates and 345 varieties, and not one of the 20,000 apples had on it a blemish of any kind.

On the same date twenty-one varieties of pears, seven of quinces, and five of grapes were staged. The commissioner would not allow the superintendents to spend any money for grapes for an exhibit of fruit grown in 1900, and the few baskets of these five varieties were put in at the expense of the superintendents. Only 100 pounds were put in cold storage, and 96 pounds were shown from May 20 to July 10. The Catawbas on the plates on July 4 were in good condition, and we were offered thirty cents per pound for them.

Two gold medals and two silver medals were awarded the state on these exhibits, and a dozen gold, silver and bronze medals were awarded to individuals who grew the fruit.

The fruit of 1901 was a revelation to every one, and easily placed New York at the head — especially as a grower of apples. No other state showed so many specimens nor so many varieties, and none could compare in quality. We were the first state to place apples on the tables, ripe fruit being shown on June 12.

The fruit *Ceriman Monstera Deliciosa* was also from New York, being grown under glass at Cornell University.

On strawberries the state received a gold medal; the exhibit was continuous from June 23 to October 31. We displayed over one hundred and eighty varieties, from 163 different exhibitors. On June 29 we had more than seven hundred plates of gigantic Marshalls on exhibition, also twelve hundred plates of 167 other varieties.

The exhibit of bush fruits was very complete, and the state received a gold medal for this display. One day there were displayed 139 varieties of gooseberries.

The length of the season for currants was demonstrated by showing some sixty varieties over a period of forty-three days.

The raspberry show lasted from July 3 to August 22. Blackberries, whortleberries and dewberries helped to demonstrate the supremacy of the state as a section for the production of small fruits. Fourteen varieties of apricots and four of nectarines were shown.

On plums, peaches, and grapes, no state came anywhere near meeting New York. On grapes we exhibited four times as many varieties as any other state, and received more medals and prizes than all the rest of the states together. The largest and heaviest cluster of grapes at the exposition, weighing 8 pounds 9 ounces, was grown in New York State and beat the California cluster by nearly two pounds in weight.

Among the features of the exposition which were largely commented on by the daily press were the fruit pictures and panels done in fresh fruit, designed by the writer and executed by Julius Heinrich. These were continued throughout the exposition, and were complimented by thousands. On this display the state of New York won thirteen gold medals, three silver medals, and one bronze medal. Thirty-six gold medals were awarded to the exhibitors, giving New York nearly one-half of all the gold medals awarded in the horticultural department. Forty-six silver medals were also awarded to exhibitors, and over four hundred other awards were made.

Reference to this exhibit would not be complete without saying something of the work done by the late S. D. Willard, of Geneva, who gave his services as superintendent without remuneration. His keen interest in demonstrating the state's horticultural supremacy, his wide acquaintance among fruit growers, and his personal popularity made the work light for those who were associated with him.

NEW YORK FRUIT AT THE LAND SHOWS AND AT THE SAN FRANCISCO EXPOSITION**CHARLES G. PORTER, ALBION, N. Y.,****In Charge of New York Horticultural Exhibits at Land Shows and at San Francisco Exposition****NEW YORK LAND SHOWS**

At the Land Show in Madison Square Garden, in November, 1911, an exhibit of fruit from the state of New York was installed. It consisted of packed boxes of apples, as also full packed barrels and sections of packed barrels. The exhibits also contained pears, peaches, canned fruit and various fruit productions.

From November 11 to December 4, 1912, the second state exhibit of fruit was shown at a New York Land Show. At this exhibition, apples and pears were shown. Since, after the show was decided upon, there was less than two weeks' time in which to collect and install the fruit, it was collected from orchards and barns where the fruit had been packed for market and was therefore not selected for exhibition purposes. This was an excellent feature of this exhibit; for, notwithstanding all that has been said about the farmer's poor pack, one was able to go to various farms and select boxes and barrels of apples that had been packed in the regular way and which went to make up a large and attractive exhibit of New York State fruit. As this was an exhibit of two hundred packed barrels, massed in a bunch on such an angle as to show the entire face end of each barrel, and one hundred and seventy-five full packed boxes installed upon a rack five boxes high and so arranged as to make a background for the barrels, it made a very attractive exhibit.

There were hundreds of children and many grown people — consumers of fruit — who looked for the first time upon a full barrel of apples, and who for the first time learned that apples grown in the state of New York were marketed in barrels and not in half-pecks. From this exhibit, apples and pears were

handed out to the visitors, who could taste and judge for themselves the superior quality and flavor of New York apples.

CHICAGO LAND SHOW

At the Chicago Land Show, held November 20 to December 11, 1913, the state showed a large exhibit of apples. The installation scheme was of an oblong pyramid with most of the fruit shown in box flats and barrel ends, showing how boxes should be packed and how barrels should be faced and tailed up at the press end. There were one hundred and fifty boxes and ninety barrel



FIG. 182.— EXHIBIT OF NEW YORK STATE APPLES AT THE NEW YORK LAND SHOW, 1912

ends; there were also about fifty full packed barrels and one hundred plates — thirty varieties in all.

The fruit was grown in the leading fruit counties of the state, and was selected so as to give a fair representation of the fruit in the county from which it came. There was no desire to show overgrown specimens or varieties without a commercial value. We had fine color, good size for each variety shown, and uniformity in pack, with fruit of the highest quality — all of which

went to make up a very attractive exhibit. The aroma from the New York fruit so completely filled with its delicious fragrance that portion of the great colosseum in which it was staged that many people asked if New York fruit had ever been shown there before, saying that it was the first time such fragrance of fruit was ever noticed at the Land Show.

One feature of this exhibit was the distribution of apples to visitors, and, although many barrels of apples were handed out in this manner, the one thing lacking was that there was not enough fruit for this purpose. Hundreds of people visiting the exhibit did not know that New York was an apple-growing state, and were much surprised to see such beautiful fruit from other than a western state. It was hard for them to believe, when they read from a placard on the exhibit, that "six counties in the state of New York produced more apples than all the states except Pennsylvania."

This exhibit showed very clearly the keeping qualities of New York fruit. After remaining on exhibition for three weeks the fruit was just as attractive as on the opening day.

THE PANAMA EXPOSITION

To arrange for and install an exhibit of fruit creditable to the great fruit interests of the state of New York, three thousand miles away from home, is a considerable undertaking.

In selecting the fruit for this exhibit, the same care was used as in previous exhibits — to select only varieties of commercial value and from various fruit counties of the state. As the exposition was not open until February 20, apples only could be shown at the opening. It was necessary to have a cold storage and packing house centrally located, where the fruit was received. At this place it was all repacked in the various ways in which it was to be shown and then returned to the cold storage until the time necessary to load it for San Francisco. There were twenty-five varieties selected for this exhibit. The stock consisted of three hundred and thirty-six packed box flats and one hundred and thirty barrels, packed with various varieties to be shown in different ways. There were also fifty-two dozen of the finest canned fruit produced in the state, consisting of ten varieties,

all of which made up one large refrigerator car load. About three weeks from the time of shipment it arrived at San Francisco, when the fruit was again placed in cold storage, where it remained until the exhibit was installed. The excess was left in storage to be drawn upon from time to time as the exhibit required.

The space allotted to the state of New York in the Horticultural Palace, was 40 x 34 feet. The booth was made after the style of a colonial pergola, having large columns, with massive beams and crossbeams and large scroll lattices at either end, artificial grapevines running up and covering the crossbeams with their

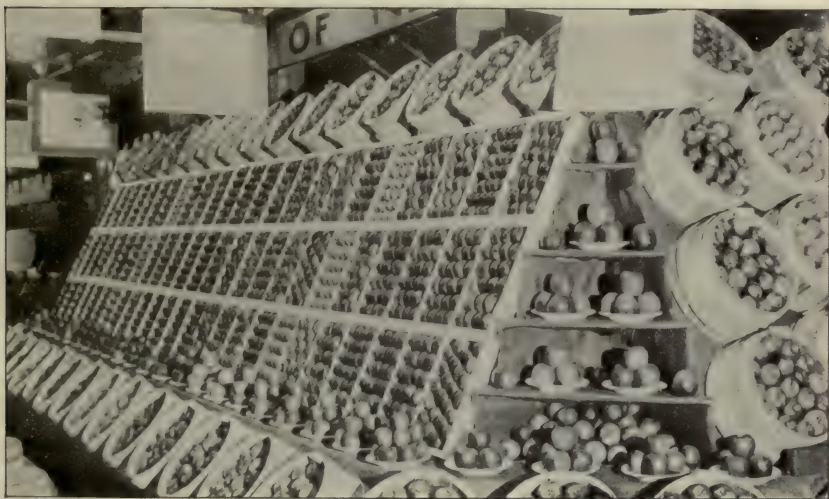


FIG. 183.—EXHIBIT OF NEW YORK APPLES AT THE CHICAGO LAND SHOW, 1913

autumn-tinted foliage, fruited with variously colored bunches of fruit. Diagonally across each end of the space, and meeting on either side of a mirrored door in the back, there were built two refrigerator cases, each being twenty feet long and thirteen feet high, with panelled glass fronts seven feet high, the color scheme of the entire booth and cases being cream and apple green. In each case there were placed eleven hidden 40-watt electric lamps, which threw a beautiful soft light upon the fruit.

In one case sixty-eight boxes of apples were shown, making seventeen rows four boxes high. In the other there were forty barrel ends, some showing face ends and others showing the tail

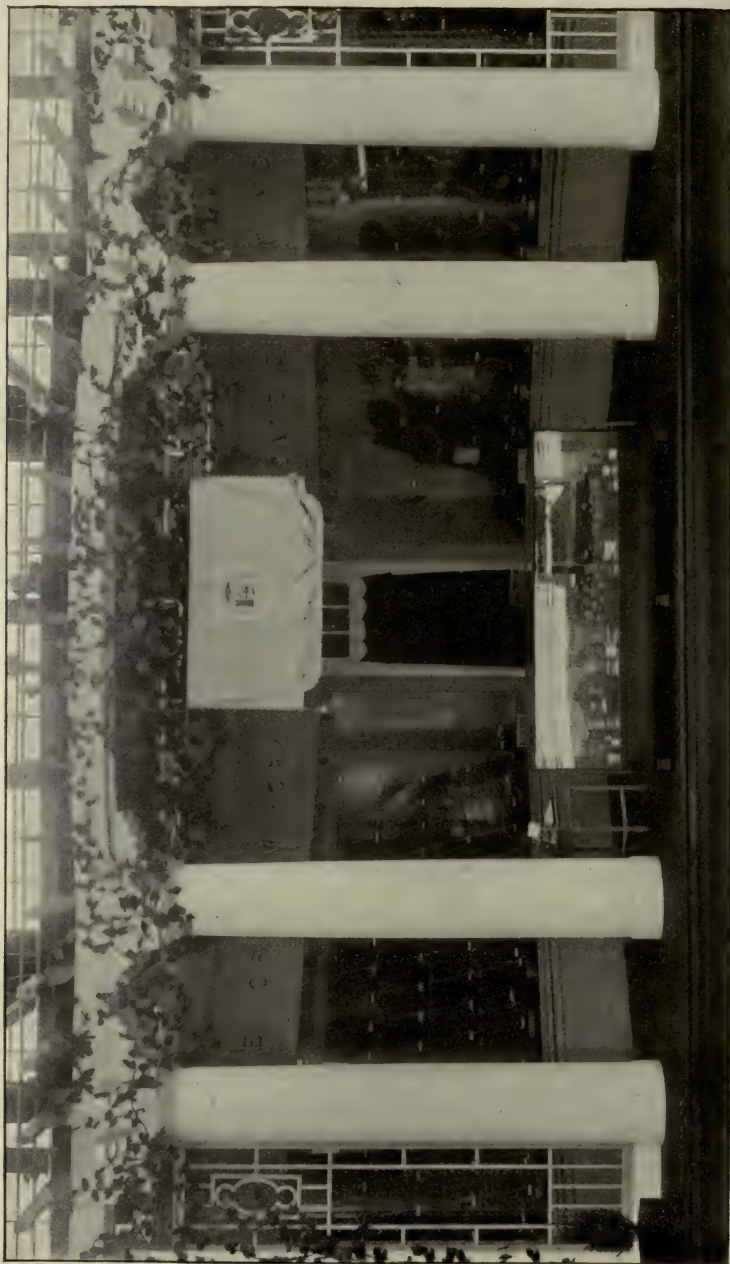


FIG. 184.—NEW YORK STATE FRUIT EXHIBIT AT PANAMA EXPOSITION

or press end of the barrel. These were piled four barrels high and represented New York standard pack. There were a number of varieties and colors in each case, so arranged as to make the exhibit attractive, with a row of fancy baskets filled with the choicest fruit of the exhibit placed upon the floor of each case in front of the boxes and barrels. With the soft glow of the electric lights, the New York exhibit of fruit was always a beautiful picture, which attracted much attention.

This exhibit stood practically without change until the second week in May, when some changes were made, but still leaving twenty-two varieties in the exhibit. September 6 there were sixteen varieties of the 1914 fruit on exhibit, including Rhode Island Greening, Pumpkin Sweet, Hubbardston, and McIntosh. At this time there were some varieties of 1915 fruit, and with other varieties following as fast as matured, the exhibit was all changed to the fruit of 1915.

If space would only allow, how very interesting it would be to quote the remarks of visitors written in the large register at the exhibit, where hundreds registered every day!

Nearly every day until May 15, New York State apples were distributed to visitors. People from all states, and many foreigners, had the pleasure for the first time of tasting a rich, juicy, well-flavored New York apple. Visitors were much surprised to learn that New York was an apple-growing state, that it grew such beautiful fruit, and that its 1914 crop was fifty million bushels, about one-fifth of the entire production.

Dealers in fruit, from various states and foreign countries, were among our most interested visitors, always expressing a desire for New York fruit and information concerning it. Consumers would frequently visit the exhibit for the purpose of purchasing fruit by the box or barrel, and would show much disappointment when told that such could not be done.

In a brief word of conclusion I wish to add that with the wide range of advertising by these exhibits, placed before thousand of consumers from all over the world who for the first time saw or tasted a New York apple, their value to the fruit interests of the state of New York is immeasurable.

NOTE.— The following telegram was received from Mr. Porter on November 23:

EXPOSITION GROUNDS,

SAN FRANCISCO, CAL., November 23, 1915

HON. CHARLES S. WILSON, Albany, N. Y.:

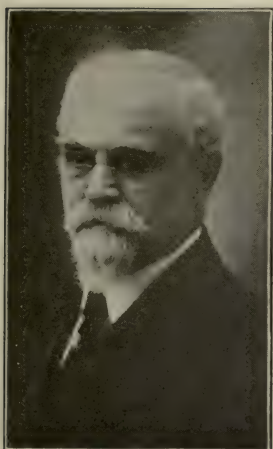
The state of New York exhibit of fruit at the Panama-Pacific International Exposition at San Francisco has just been awarded Grand Prize, also thirteen gold medals, fifteen silver medals, eleven bronze medals and twelve honorable mention medals.

CHARLES G. PORTER.

THE WESTERN NEW YORK HORTICULTURAL SOCIETY

JOHN HALL

Secretary of the Society, Rochester, N. Y.



The first record we have of the organization of fruit growers in the Empire State is that of the Fruit Growers' Society of Western New York, in 1855. It came upon the scene at a time when the New World was beginning to witness numerous demonstrations of the inventive genius of man. The successful use of illuminating gas in this country had been practiced for less than a quarter of a century; travel by steam railroad had not become a fact until about the same period; and not until 1844 was the first public telegraph in this country completed.

In 1870, the Fruit Growers' Society of Western New York changed its name to "The Western New York Horticultural Society." Six years later Alexander Graham Bell discovered the principle which culminated in the invention of the telephone, and still several years later followed the general commercial introduction and development of electric lighting.

Agricultural experiment stations and agricultural colleges were not known in the United States until about twenty years after the Western New York Horticultural Society was born. The first experiment station we read of was established at Middletown, Conn., in 1875, and our own New York Agricultural Experiment Station became a fact in 1882, seven years before the writer of this article became the secretary-treasurer of the organization of which this article is the subject.

The history of the old Western New York Horticultural Society would make intensely interesting reading if published in detail. This, however, it will be impossible to do here. The wonderful progress made in the development of fruit growing in

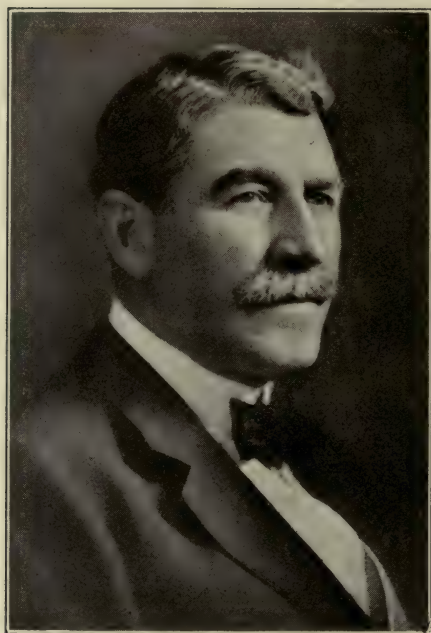


FIG. 185.—W. C. BARRY, PRESIDENT,
WESTERN NEW YORK HORTICULTURAL
SOCIETY, 1915-16

this state, and the enviable place the society occupies today among similar organizations, agricultural experiment stations, and colleges of agriculture in the United States and Canada, constitute the highest testimonial to the sixty years of intelligent and successful effort consecrated to the cause which it has long represented and still represents.

The circular letter which called into existence the institution of which we write read as follows:

A Pomological Society for Western New York

A meeting of the fruit growers and nurserymen of Western New York will be held at the Court House in the city of Rochester, on Tuesday, February 27, 1855, at two o'clock P. M., for the purpose of organizing a pomological society to embrace all the counties lying west of and including Onondaga.

The culture of fruits in this region is becoming an important branch of industry, and the projected society cannot fail to exert a powerful influence in advancing its interests.

At that meeting an organization was effected, constitution and by-laws adopted, and the following gentlemen paid their dues and were enrolled as charter members:

Patrick Barry, George Ellwanger, D. D. T. Moore, H. E. Hooker, C. T. Cherry, G. H. Cherry, James Vick, Jr., Joseph Frost, Ira Belden and Moses Long, Rochester; John B. Eaton and William R. Coppock, Buffalo; William P. Townsend and Claudius L. Hoag, Lockport; C. I. Ryan and Robert Donellan, Greece; John J. Thomas, Macedon; Zerah Burr, Perinton; H. P. Norton, Brockport; Austin Pinney, Clarkson; Philip R. Freeoff, Auburn.

Shortly after the launching of the society the late celebrated Charles Downing became a member and an ardent supporter.

The first officers elected were: President, John J. Thomas, Macedon. Vice-Presidents, Lewis F. Allen, Buffalo; H. P. Norton, Brockport; E. W. Leavenworth, Syracuse. Secretary, John B. Eaton, Buffalo. Treasurer, William P. Townsend, Lockport.

As an illustration of the earnestness and enthusiasm of these pioneer fruit growers, we quote from the record of 1855 a few of the entries in the fruit exhibit at that meeting:

Lewis F. Allen — 26 varieties apples, 13 of pears, 7 of plums.
Wm. R. Coppock — 29 varieties pears, 5 of apples.

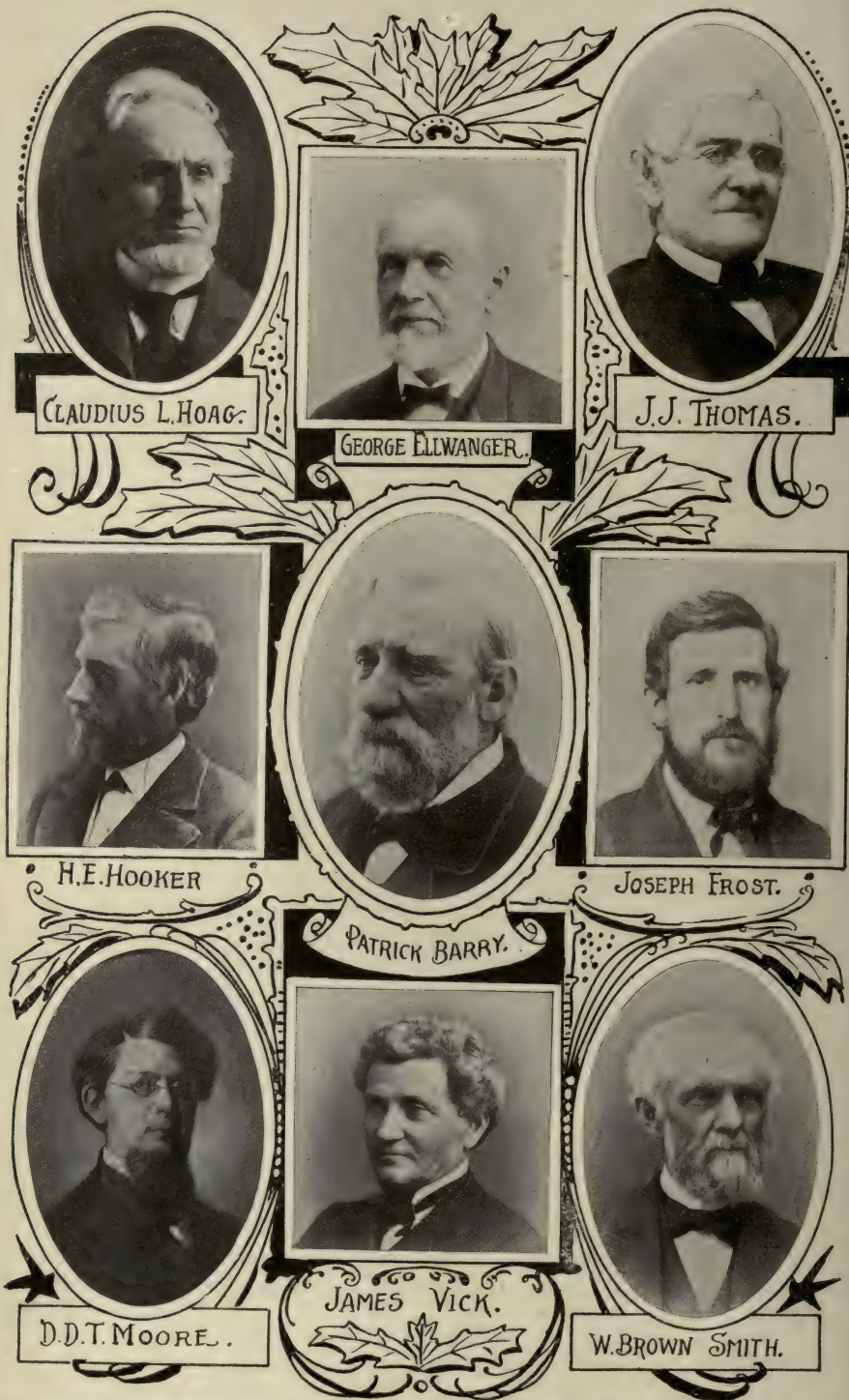


FIG. 186.—PIONEER MEMBERS OF THE WESTERN NEW YORK HORTICULTURAL SOCIETY

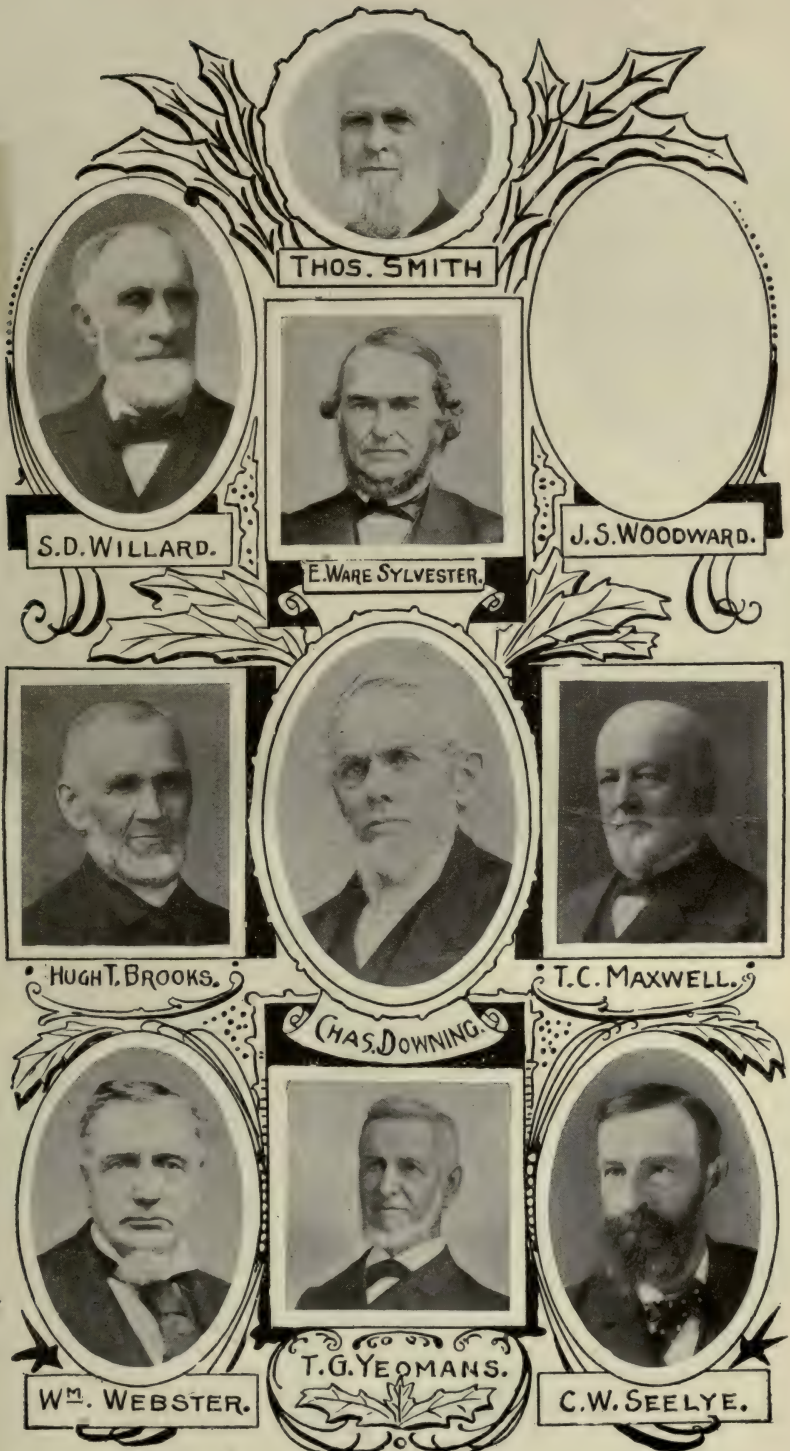
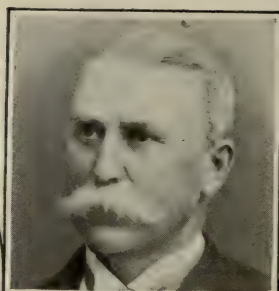


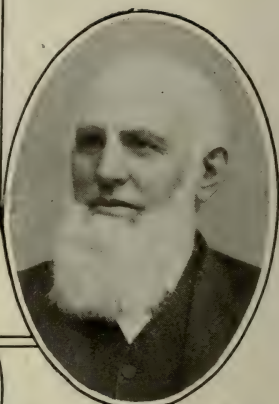
FIG. 186.—(Continued)



C. M. HOOKER.



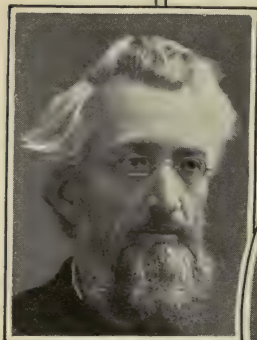
E. A. FROST.



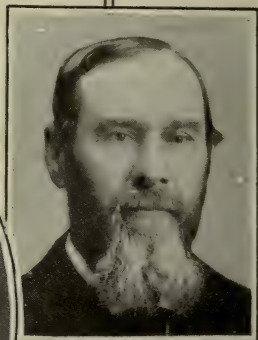
E. W. HERENDEN.



ELISHA MOODY.



D. W. BEADLE.



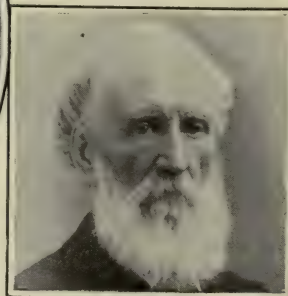
JACOB MOORE.



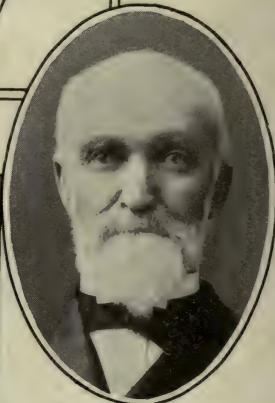
H. P. NORTON.



JOSEPH HARRIS.



BENJ. FISH.



FOSTER UDELL.

Lewis Eaton — 29 varieties pears and 18 of apples.

Ellwanger & Barry — 156 varieties pears, 76 of apples.

Frost & Co.— 39 varieties pears.

Claudius L. Hoag — 29 varieties pears and 36 of apples.

H. E. Hooker & Co.— 73 varieties pears and 33 of apples.

Hooker, Farley & Co.— 22 varieties pears and 47 of apples.

Manley & Mason — 89 varieties pears and 43 of apples.

Henry P. Norton — 33 varieties pears.

Penfield & Burrill — 71 varieties pears and 30 of apples.

John J. Thomas — 36 varieties apples.

Wm. P. Townsend — 74 varieties pears.

Godfrey Zimmerman — 17 varieties pears and 32 of apples.

The writer wishes the fruit growers of today would show similar enthusiasm and generosity at the annual meetings of the Western New York Horticultural Society.

For lack of space we here condense the record of presidents of the Society: 1855-1857, J. J. Thomas; 1858, H. P. Norton; 1859-1860, Benjamin Hodge; 1861, Elisha Moody; 1862-3, Hugh T. Brooks; 1864-5, Patrick Barry; 1866-7, H. E. Hooker; 1868, W. Brown Smith; 1869, James Vick; 1870-1890, Patrick Barry; 1891, William C. Barry (still serving).

From 1855 to 1874 the secretaries were: C. P. Bissell, John B. Eaton, James Vick, H. G. Warner, Sam P. Wakelee, Wm. J. Fowler, W. P. Bissell. In 1874, Platt C. Reynolds was elected and served till 1889 (fifteen years), his successor being John Hall, who is still serving (27 years).

Patrick Barry sought to resign the presidency in 1890, but the Society re-elected him, the late S. D. Willard declaring that "so long as Patrick Barry is able to write the words 'Yours truly,' he must be continued as president."

At the 1914 meeting the secretary read a "Brief Sketch of Twenty-Five Years of Service," from which we make several extracts:

The year following my assuming office the membership numbered 210; five years later it was 439; still five years later the number was 590; in another five years it had reached 672; and in five years more, the year 1910, the total was 1,467. * * *

By comparison with those engaged in the fruit-growing industry in the early history of this society, the progressive fruit grower of today is scientific

—knows his business. The Geneva Experiment Station and the College of Agriculture at Ithaca have helped him to solve many of his problems, and the annual meetings of this society have been the clearing house where all have met, and, by discussion and illustration, information has been gained to the mutual profit of both. The research work of these hives of industry at Geneva and Ithaca has been made more effective because of the close intimacy existing between them and this society.

I could recount incidents from the records of this organization which, in the light of present knowledge, would cause a smile. Do the men who have fallen heirs to so goodly a heritage think that the pioneers of those early days, who were groping after light upon their problems in orchard management, were old fogies? Nay, nay; they were men of large patience, unlimited faith and strong determination; and men should be thankful to live in this day and age when innumerable avenues of helpfulness invite the footsteps and brains, and make tasks easier and efforts more successful than was possible to our forebears. Here, again, we claim credit for the work of this society.

I should have liked to review the progress made in combating insect and fungus diseases, the general care of the orchard, and the advent and widespread use of the spraying machine, etc., but time forbids.

During my term of office two of the society's greatest benefactors have crossed the river, but have perpetuated their names and their interest in our work. We have the Barry donation of \$2,000, from the interest of which the Barry gold medal is to be awarded to the originator of a new fruit or ornamental tree, shrub, flowering plant or vegetable; and we have the George Ellwanger donation of \$1,000, from the interest of which are to be paid cash prizes for the best-maintained private place, and for the best-maintained private collection of large and small fruits. The outcome of these donations was the raising of other moneys which gave a permanent fund of over \$4,000.

During the years that prizes were offered by the New York State Agricultural Society for the largest and best collection of fruit exhibited at the state fair by organizations, this society captured nearly \$5,000 in cash premiums. * * *

Now, as to the future. Among the many problems yet to be solved may be mentioned those of better transportation facilities, an advance in which has been made, locally, during the past year; cooperation in its broadest sense; better sorting and better packing by both grower and buyer, and such a distribution of your products as shall make possible the supplying of every man, woman and child in the land with the delicious, health-giving fruits of vine and tree as produced in this section of country, which has been so peculiarly blessed by the Creator in its climate and soil and other agencies which make it possible for you to grow fruit that is not surpassed in quality, and much of it in color, by that grown in any other section of the United States.

Some of our oldest members have been removed by death: Claudius L. Hoag, a charter member of the society; S. D. Willard, C. M. Hooker, and D. R. Pease; also one of our youngest life members, J. Sumner Allis, son of Mr. Clark Allis, whose grandfather was a member of this society.

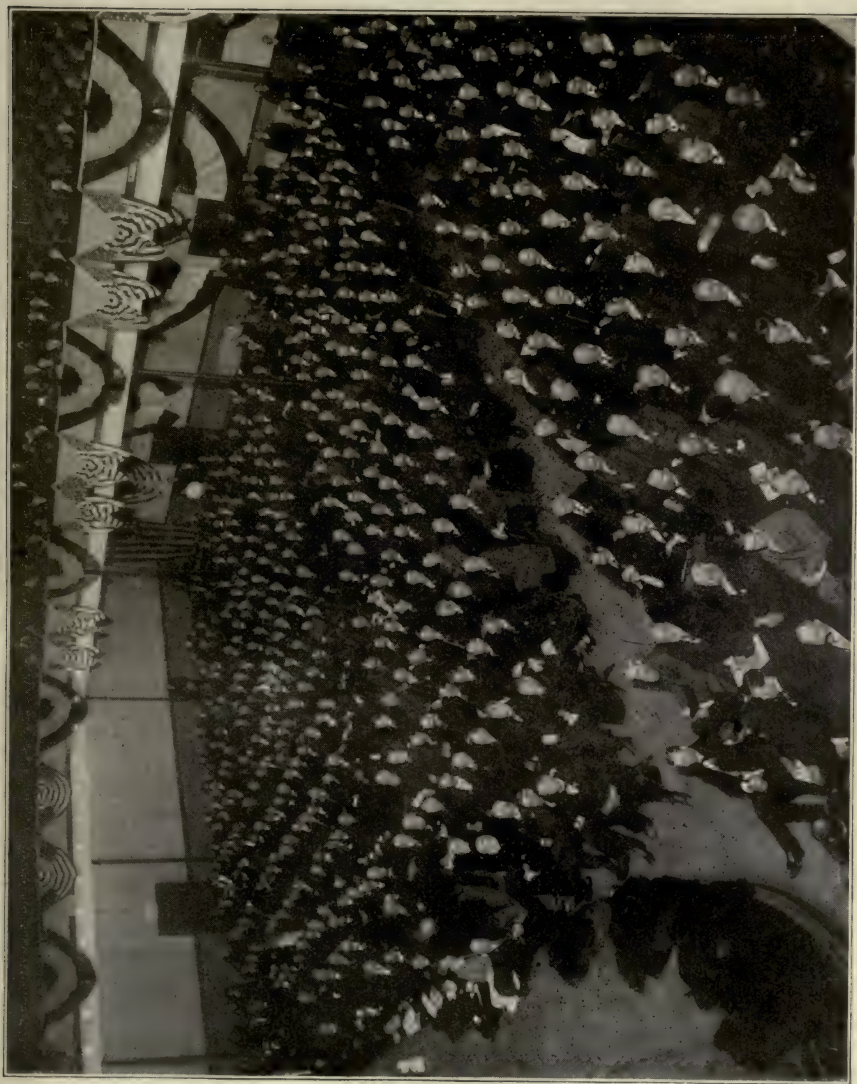


FIG. 187.—SNAPSHOT OF AN AFTERNOON SESSION

The prime object of this society, as expressed in its constitution, is educational — the promotion of the advancement of the science of pomology and the art of fruit culture generally, and in harmony with this expressed declaration the programs presented at the annual meetings have always been prepared. The best horticultural authorities from far and near have appeared upon our platform.

This society was the first in the country to encourage the exhibition at its annual meetings of spray nozzles and other devices, and subsequently of spraying apparatus, from a spray syringe to a power spraying machine.

The officers of the society for the year 1915 are:

President

W. C. Barry

Vice-Presidents

S. J. T. Bush, Morton

F. H. Lattin, Albion

George T. Powell, Ghent

M. E. Ross, Avon

A. L. Whitbeck, Sodus

Wm. H. Roeper, Wyoming

Secretary-Treasurer

John Hall, Rochester

Executive Committee

B. J. Case, Sodus

Geo. W. Dunn, Webster

J. Corwin Jacks, Batavia

E. W. Catchpole, North Rose

Samuel Fraser, Geneseo

As a stimulus to members, winter exhibits of fruit are made at the annual meetings, some hundreds of dollars being paid in premiums.

The annual membership fee is \$1; that for a life member is \$10. Either entitles the member, in addition to participation in the meetings, to the annual report, a volume of more than 200 pages, containing all the addresses and discussions at the annual meeting, and worth many times a dollar as a book of reference. A set of these reports mark the horticultural progress of more than half a century.

THE NEW YORK STATE FRUIT GROWERS' ASSOCIATION

E. C. GILLETT

Secretary of the Association, Penn Yan, N. Y.



There are no records in the Secretary's office concerning the organization and work of this association for the first two years of its life. The first record is of the annual meeting held at Buffalo, N. Y., in January, 1903.

From different reports since that time I learn that the association was organized two years previously, or on February 28, 1901. A preliminary meeting was held in Rochester at the time of the meeting of the Western New York Horticultural So-

cietly. Over a hundred men, who were fruit growers and who felt that their interests as growers would be better served by an organization not so closely connected with the nursery trade, met in a hotel and organized this association.

The 1902 meeting was held in Syracuse. Mr. L. T. Yeomans of Walworth was elected president. Mr. Yeomans served as president two years, or until January, 1903, when T. B. Wilson, of Hall, was chosen. Mr. Wilson served as president four years, 1903-4-5-6; Mr. J. R. Cornell, of Newburg, served in 1907-8; Mr. B. J. Case, of Sodus, in 1909-10; Mr. Clark Allis, of Medina, in 1911-12; Mr. L. L. Morrell, of Kinderhook, in 1913-14. Mr. Frank Bradley, of Barker, was elected last January and is now president.

Mr. F. E. Dawley, of Fayetteville, served as secretary until 1904. Mr. W. L. McKay, of Geneva, served two years, 1904-5. E. C. Gillett, of Penn Yan, was elected secretary in 1906, and has served continuously since that time.

Mr. C. H. Darrow, of Geneva, was treasurer until 1910, when the office of treasurer was combined with that of secretary.

Until 1910, the annual meetings were held in different sections of the state — Syracuse, Buffalo, Geneva, Penn Yan, Lockport and Medina. Since 1910 the meetings have all been held in Rochester.

The constitution gives seven definite objects which the association should aim to reach.

1. To secure and disseminate practical and scientific information concerning fruit growing.

2. To secure legislation which may be advantageous and prevent that which may be detrimental.

3. To secure improved facilities of transportation.

4. To secure a better and more uniform system of packing and packages.

5. To devise some system of marketing our products.

6. To obtain an improved system of crop reporting.

7. The cooperative purchase of supplies.

In only one of these seven objects which the association sought to obtain have we failed to accomplish results. We have never been able to devise and put in operation a marketing system.

The first point, that of securing and disseminating information, we have most thoroughly carried in our annual meeting and in our reports.

Our legislative committee has been able to secure the passage of some needed legislation. Laws regulating the size of the apple barrel and box, and grape and other fruit packages; fumigation of nursery stock; licensing and bonding the commission men; the nurserymen's liability law, and the packing and grading law are noticeable instances of legislation favorable to our interests, which have been secured largely by our efforts.

Much has been done toward securing better transportation facilities, notably in Weston, N. Y., in the peach-growing section.

The crop reports have been issued from the office of the secretary either two or three times each season, and, with the cooperation of the members, the secretary has been able to give such reports as are reliable and accurate. They have proved to be as accurate as the government reports or any crop reports issued, and are so regarded by the trade.

Perhaps our greatest success has been in the cooperative purchase of supplies. We have been able to purchase vitriol, arsenate

of lead, paris green, sulphur, fertilizers, etc., so as to save thousands of dollars to our members and incidentally to benefit every fruit grower in the state, whether members of the association or not, because our trade has helped to bring down and keep down the price of all these materials. We have purchased for our members nearly \$100,000 worth of supplies.

In March, 1905, the association was regularly incorporated.

EASTERN NEW YORK SOCIETY

The Hudson Valley Horticultural Society was organized in 1896, with James Wood, of Mt. Kisco, president; W. F. Tabor, Poughkeepsie, vice president; Edward van Alstyne, Kinderhook, secretary; B. D. Van Buren, Stockport, treasurer; E. G. Fowler, Port Jervis, corresponding secretary.

The first meeting was held at Poughkeepsie. The next year the title was changed to the "Eastern New York Horticultural Society," the officers being the same, except that the office of treasurer and corresponding secretary were merged into that of secretary.

In 1898, the annual meeting was held at Albany, Edwin C. Powell, of Westchester County, succeeding Mr. van Alstyne as secretary.

In 1899, and until the society was merged with the Fruit Growers, the annual meetings were held at the American Institute, New York City. At that time Mr. Charles H. Royce, of Rhinebeck, Dutchess County, succeeded to the secretaryship.

In 1900, Mr. Geo. T. Powell, of Ghent, Columbia County, became president.

For three years the association published a quarterly journal known as the "Hudson Valley Horticulturist," which contained the annual report and other matters of interest to the members.

Very soon after the organization of the state society in 1901, the Eastern New York Horticultural society by unanimous vote became a part of this association, turning over their annual and life members numbering 275 to this association, also such funds as were in the treasury, the New York State Fruit Growers' Association agreeing to hold an annual meeting each year in the Hudson Valley.

SUMMER OR FIELD MEETINGS

Summer or field meetings have been held each year. Two have been held at Sodus, two at Olcott Beach, two at the Experiment Station at Geneva, one each at Penn Yan, Albion, Hilton, Ithaca, Fredonia, and Plattsburg.

The educational feature in the way of speeches, etc., is subordinated largely to the visiting of large fruit farms and learning by observation instead of precept. It has come to be regarded by our members as the annual event of the summer.

HUDSON RIVER FRUIT EXCHANGE

WM. Y. VELIE, MARLBORO, ULSTER CO., N. Y.

ITS CONCEPTION AND ORGANIZATION



In March, 1912, the writer, with Mr. C. E. Thurston of New York City, called on the representative fruit growers living in that section of country located on the west bank of the Hudson River between Newburg and Highland, known as the Central Hudson fruit district. The object of this call was to present a plan of organizing the fruit growers of this section for the purpose of mutually protecting their interests through cooperation. The suggestions made met with such universal favor that

a meeting was called about ten days afterwards, which forty in-



FIG. 188.— EXTERIOR OF OFFICE OF HUDSON RIVER FRUIT EXCHANGE
[731]

terested growers attended. At this meeting the whole project was discussed, and a committee of five were appointed to draft a constitution and by-laws, which are printed below. The only change made is that we increased our capital stock to \$4,000 at our yearly meeting, May 1, 1914.

CONSTITUTION

ARTICLE I

This Association shall be called the Hudson River Fruit Exchange, Inc. It shall have a capital stock of two thousand (\$2,000) dollars, divided into one hundred shares of twenty (\$20) dollars each, fifty per cent of which shall be paid in at once, and the remaining fifty per cent at such times and in such installments as may be directed by the Executive Committee. It shall be incorporated under the laws of the state of New York, and when fully paid its shares shall be non-assessable. No member may own more than four shares of stock. Stock in this exchange carries no voting power, but each registered member is entitled to one vote.

On February 28, 1914, the amount of capital stock was increased to four thousand dollars (\$4,000) divided into two hundred shares of twenty (\$20) dollars each.

ARTICLE II

It shall embrace the fruit growing sections along the Hudson River, with headquarters at Milton, Ulster County, N. Y.

Its members shall consist of such persons as are growers of fruit for market and are accepted by the Executive Committee, and have purchased at least one share of the capital stock at such price as the Exchange may name.

ARTICLE III

An Executive Committee of seven members shall have the general management of all the affairs of the Exchange. They shall be elected by ballot at the annual meeting in 1912, one for the term of three years, two for the term of two years, and two for the term of one year. At the annual meeting of 1914 two members shall be elected to serve for a term of one year. At each subsequent annual meeting members shall be elected for the term of three years, to fill vacancies of the outgoing class. The Executive Committee shall fill vacancies, to serve until the next annual meeting.

A majority of the Executive Committee shall constitute a quorum. The Executive Committee shall have the power to appoint Auditing and other special committees as occasion may require. The Executive Committee is prohibited from borrowing money in the name of the Exchange except when specifically authorized.

ARTICLE IV

The Executive Committee shall appoint from its body, members to act as President and Vice-President, for terms of one year, and shall further appoint a stockholder, who may or may not be a member of the Executive Committee, to act as Secretary-Treasurer for a term of one year.

ARTICLE V

Any member of the Executive Committee shall be subject to recall by the Exchange. Upon a petition being signed by at least twenty-five per cent of the members, the Executive Committee shall call a special meeting of the Exchange to consider the petition, and a two-thirds vote of the total members present shall recall such committeemen from office.

ARTICLE VI

The Constitution and By-Laws may be amended by a vote of two-thirds of the members present at any meeting of the Exchange, provided notice of the proposed amendments, with a copy of the same, be mailed to each member at least ten days in advance of such meeting.

BY-LAWS

ARTICLE I

The regular annual meeting of the Exchange shall be held on the first Saturday after the first Sunday in May of each year, except in 1912, when the organization meeting shall be considered the annual meeting for that year.

The Executive Committee shall have the power to call such meetings as it may deem necessary or expedient, notices of such meetings to be mailed to each member at least three days prior thereto.

The Executive Committee shall meet at such times as may seem advisable to it, or at the call of the President.

ARTICLE II

The fiscal year of the Exchange shall be from May 1 until April 30 inclusive.

ARTICLE III

Copies of all rules and regulations which may from time to time be made by the Exchange or its Executive Committee shall be mailed to each member.

ARTICLE IV

The Executive Committee shall have power to suspend from the Exchange any member who does not comply with all the laws, usages and regulations now in force or which may hereafter be adopted by the Exchange or its duly authorized Executive Committee. If a suspended member desires, the President shall, upon a petition signed by ten members, call a special meeting of the Exchange to act upon his case, and said suspended member must abide by the decision arrived at by a majority vote of the members present at said meeting.

ARTICLE V

All bills authorized by the Exchange or its Executive Committee and all other payments especially authorized by the Exchange shall be paid by the Treasurer by check, countersigned by the President.

ARTICLE VI

Members of this Exchange bind themselves when consigning fruit to ship only to commission houses or auctions, duly designated by the Exchange.

They also agree to ship all fruit up to the grade under the label of the Exchange, and fruit not up to grade without the label.

ARTICLE VII

Fruit sold through the Exchange f. o. b. shipping point or on track shall pay to the Exchange a commission of three per cent of the gross price. In such cases the Exchange stands behind such sales and guarantees the price to the grower. The members reserve the right to negotiate private sales on which no commission shall be due the Exchange.

ARTICLE VIII

At the end of each fiscal year, after all the expenses of the Exchange shall have been paid, the Executive Committee shall from any surplus remaining declare a dividend not exceeding five per cent on the par value of shares issued. The entire balance of such surplus shall be distributed among the members who have shipped fruit through the Exchange during such year in proportion to the value of their respective shipments.

As Milton is the most centrally located of our loading stations, the office is situated there. In May we were incorporated and

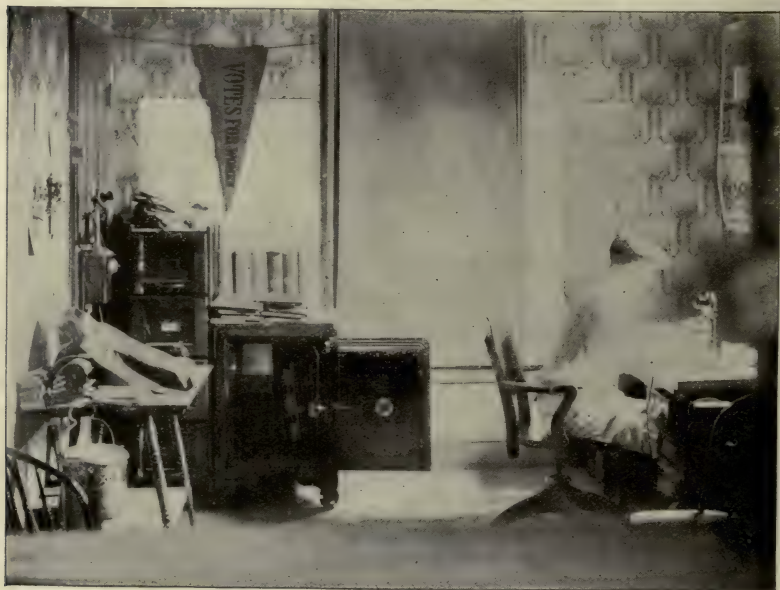


FIG. 189.—OFFICE OF HUDSON RIVER FRUIT EXCHANGE

ready for business. Our first problem was to secure a manager to run the office, which, by the way, is the most important part of the organization. We knew of no one suitable, since one of the

requirements was that he should not be personally interested in any one of the members; therefore we advertised for a manager that understood the fruit business along the line on which we were working. We succeeded in hiring a very competent young man, who, through his ability and energy, soon established us as an organization that had fruit to sell at right prices, quality considered.

Since we need a source of income to pay the running expenses of our office, we adopted the following plan: All members are charged 3 per cent on the supplies purchased for them and on all sales of fruit made by the exchange. If a commission were paid to the association on all sales made by each member it would be



FIG. 190.— STORAGE ROOM OF HUDSON RIVER FRUIT EXCHANGE

much better, but this restriction could not be enforced at once. However, we have hopes of soon amending our by-laws covering this point.

SELLING THROUGH COMMISSION HOUSES

We had as our main object the selling of our fruit f.o.b. loading station, but realized that we could not accomplish this ideal condition at once. We were thus compelled to make ar-

rangements with commission houses in the different large markets. It is the custom of commission houses to charge 10 per cent for selling the fruit and paying a soliciting agent 3 per cent for his services. We therefore arranged with a limited number of commission houses to pay the exchange this rebate on all fruit sold for the members of the exchange. It has been our policy to concentrate our shipments, and to that end we selected a limited number of commission houses to sell our fruit. In the beginning they were a little backward about signing up in this way, but since we demonstrated that we are here to stay, we have many more applications than we care to sign up for. Our office being centrally located, and with telephone connection with almost every member, it becomes an information bureau in the truest sense of the word. In the fruit-shipping season, telephone and telegraph messages are received from all the large markets, and the manager and his assistant are kept busy advising the shippers of the best market to which to ship their fruit each day.

BUYING AND SELLING DIRECT

The office also receives quotations on all kinds of feed and other supplies needed by the members. As soon as the wants of the members amount to a sufficient quantity, the manager orders a carload or less, as the case may be; in the case of feed it must be not less than a carload. Our office is constantly mailing letters to prospective buyers of our fruit, in this way continually reminding them what we have to sell. We have thus worked up a reputation which has resulted in selling a great deal of our fruit at the station at a price equal or better than the wholesale price, thus saving the express charges and commission. In 1913, we sold all of our strawberries and pears and a large amount of our other fruits in this way.

I will now state in actual figures just what has been accomplished. During our first year we purchased 20 carloads of feeding stuffs at a saving of at least \$2,500 to our 40 members. We purchased 200 tons of commercial fertilizer, saving \$5 per ton. Spraying material, fruit packages, and in fact all we need on our farms was bought at the same average saving.

MEMBERSHIP AND FINANCES

In our initial year we bought and sold \$110,000 worth of goods, paid our office expenses, saved our members several thousands of dollars, and were encouraged to go ahead with the assurance that we were on the right track. All of this was done on a capital of about \$500.

The second year we started with an increased membership numbering 60 and with a capital of \$1,200; we did an aggregate business of \$280,000, of which \$35,000 was for goods sold f. o. b. loading stations, \$40,000 for supplies purchased, and the balance for goods sold on commission.

The third year of our work we began with a membership of 110 and a capital of \$2,200, but this year was fraught with many



FIG. 191.—LOADING BY CARLOAD AT MILTON, N. Y. MANAGER R. B. CROWELL IN FOREGROUND WITH CAP

contingencies. Prices ruled very low on most of our small fruits, especially currants, many remaining unpicked. A drought and a hail storm injured the pear, apple, and grape crops, and there were no peaches at all. In spite of all these conditions, our manager sold over 100 tons of currants and grapes respectively, at a price that helped us over the hard places. The total of this year's business was nearly \$200,000 with the same relative saving to each member, or a total saving of at least \$10,000. Our f. o. b.



FIG. 192.— LOADED FRUIT WAGONS AWAITING THEIR TURN TO DELIVER FRUIT TO NEW YORK BOAT

sales were more than the year before, which shows that we were gaining on the sale-at-home plan. We also increased our membership to 132, which tended to prove that we had made another step. Up to this time we had lost but two members; through their failure to live up to our by-laws it became necessary to suspend them.

The fourth year of our work started with a membership of 140, and was increased to 150.

ACCOMPLISHMENTS AND PROSPECTS

Just after our last yearly meeting we organized a branch office at Athens, Greene County, N. Y., which is working out very



FIG. 193.—UNLOADING FEED AT ONE LOADING STATION OF THE HUDSON RIVER FRUIT EXCHANGE

satisfactorily. This year our manager sold all of the Bartlett pears in the organization, making at least \$3,000 in the deal for the members. When currants were not worth the picking, the exchange made arrangements to press out and preserve the juice from about 100 tons of this fruit. This is something altogether new, and it looks now as if we would dispose of this product at a

profit. This could not have been done were we not organized, and goes to prove that in unity there are many ways to help each other. At the present time our office is in close touch with apple and pear buyers, which will result in making the last deals of the season bring up the average business of the fiscal year to that of the previous ones.

From our experience as related above it may seem that we had plain sailing from the start, but I must add that we have had our troubles. In the first place, it took a great deal of argument to enlist more than the original 40 members, but we have persisted, and the results we can show help us in adding new members without much solicitation. This is the first organization that has ever lasted over a few months in this section, and almost every one was skeptical as to this one. The commission houses and their soliciting agents were especially active in condemnation of it; but we have established ourselves as an institution that is here to stay, and now the commission houses urge us to put them on our list. We have many more things to do, some of which are: to arrange for a central cold storage and packing house at each station; to institute an organized system of grading fruits other than apples, the latter being now governed by state law; to provide for a mutual preserving and canning plant to care for our surplus; to develop a plan whereby we may be able to get our fruit to the consumer without the present exorbitant expense.

ESSENTIALS OF SUCCESS

The measure of success we enjoy may be attributed to having carried out the following policy: efficient office management; a conservative and interested executive committee; moderate capital used in conducting the business on a cash basis; interested and loyal membership.

THE APPLE

*Come, let us plant the apple tree.
Cleave the tough greensward with the spade;
Wide let its hollow bed be made;
There gently lay the roots, and there
Sift the dark mold with kindly care,
And press it o'er them tenderly,
As, round the sleeping infant's feet,
We softly fold the cradle-sheet;
So plant we the apple tree.*

*What plant we in this apple tree?
Buds, which the breath of summer days
Shall lengthen into leafy sprays;
Boughs where the thrush, with crimson breast,
Shall haunt and sing and hide her nest;
We plant, upon the sunny lea,
A shadow for the noontide hour,
A shelter from the summer shower,
When we plant the apple tree.*

WILLIAM CULLEN BRYANT

(From "The Planting of the Apple Tree.")



McINTOSH

INTRODUCTION OF THE APPLE INTO AMERICA AND NEW YORK STATE

CHARLES S. WILSON

New York State Commissioner of Agriculture, Albany, N. Y.



The cultivated apple, as we know it to-day, is not an indigenous fruit, but one introduced into this country by early settlers. The only native apple is what is commonly called the crab, but which scientifically belongs to four different species. They are *Pyrus coronaria*, *P. angustifolia*, *P. rivularis*, and *P. Ioensis*, all of which were found growing wild in the forest at the time of the discovery of the country. *Pyrus coronaria*, the garland crab of the Mississippi Valley and northeastern

states, is a small, slow-growing, and thorny tree producing flattened, yellow-green fruit. It is frequently confused with *Pyrus angustifolia*, a wild crab of the south, but should be easily distinguished by its narrow, half-evergreen, and shining leaves that offer a striking contrast to the short ovate and often three-lobed petioles of *P. coronaria*. Both are hard woods and uniformly smooth. The Oregon crab, *P. rivularis*, is the largest growing species of the native apple, its trees attaining to a height of from 25 to 40 feet. It is found from Alaska to northern California, and was at one time used for food by the Indians and early white settlers.

The most promising of the native apples is the prairie states crab, *Pyrus Ioensis*, which in growth, leaves, and flowers bears a striking resemblance to *Pyrus Malus*. The leaves are rather large, firm in texture, and white-pubescent underneath, growing on thick, pubescent petioles. Its fruits are spherical and spherical-oblong, a dull, rather heavy green in color, with light-colored dots on

NOTE.—In gathering the material for this article a questionnaire was sent out to about three hundred of the leading fruit-growers and nurserymen of the state, asking them for information regarding the introduction and history of the apple in their respective sections. Through the courteous response of these growers, a fairly complete history of the apple has been obtained.

the skin. They are more irregular in shape than *P. coronaria*, have a greasy feel, and are larger and less handsome. *P. Ioensis* is said to have produced a number of promising hybrids that are known as *Pyrus Soulandi*. All of the species named above are small in size and inferior in quality, and thus far are of little or no economic value. It is probable, however, that as the science of pomology advances such hardy specimens will make excellent stock with which to cross our commercial varieties or on which to graft others.

INTRODUCTION OF THE APPLE IN THE COLONIES

The history of the cultivated apple may be said to begin with the history of our own country. The earliest records are found in the history of Plymouth Colony, where Peregrine White, the first Englishman born in New England, planted an apple tree at Marshfield about 1648. In Russell's Guide to Plymouth, published in 1846, the tree is described as being seventeen feet in height, and the old trunk, then mostly decayed, was said to measure six feet in length, four and one-half feet in circumference, and to be still bearing fruit. There are likewise records of many other trees and orchards that settlers planted before the year 1700, all of them strong growers but inferior in the quality of the fruit.

In Massachusetts Colony, the farm of Governor Endicott was known by the name of "Orchard" as early as 1643. In 1648, he is recorded as having exchanged with William Trask five hundred apple trees of three-year growth for two hundred and fifty acres of land. His neighbor, William Blackstone, the first settler on the peninsula of Boston, had an orchard near his residence and raised apple trees on land that now forms the corner of Beacon and Charles streets. After his removal to Rhode Island, he planted the first orchard that ever bore apples in that state, at Study Hill, near Pawtucket. Governor Winthrop was also interested in orcharding, and in April, 1632, Conants Island in Boston Harbor was granted to him to plant a vineyard and an orchard, which thenceforth became known as the "Governor's Garden." The correspondence of his son, John Winthrop, jr., shows that he also was interested in the cultivation of fruit trees and continued the work that his father had begun. By the year 1648, a resident of Cambridge,



FIG. 194.— MONUMENT TO MCINTOSH RED, AT DUNDELA, DUNDAS COUNTY, ONTARIO, CANADA

The following inscription appears on the tablet: "The original McIntosh Red apple tree stood about 20 rods north of this spot. It was one of a number of seedlings taken from the border of the clearings and transplanted by John McIntosh in the year 1796. Erected by popular subscription, 1912." The old tree was so injured by fire that it died in 1908, when about 112 years old.

(Courtesy of John D. Dain, Morrisburg, Ontario.)

one S. Danforth, records the gathering of several varieties — among them the Long apples, Blackton's Tankerd, Kreton Pippin, Long Red apples, Russetin, and Pearmain, indicating how widespread apple cultivation had become.

In 1641, a resident of Connecticut Colony, George Tenwick of Saybrook, expresses his regret that his "good nurserie of aples haue been destroyed by wormes"; and in 1656, John Mason of the same town writes to a friend of exporting trees for planting. Several of the oldest trees on record were found here and in Massachusetts, and some of them even produced apples when nearing the second century mark. In Maine, apple orchards were said to have been planted at a very early date, and the tradition is borne out in the relics of Old Orchard Beach, where very ancient trees still existed as late as 1770.

Fragmentary though our information on the early history of the apple must necessarily be, it gives us some idea of what its introduction in the New World meant. The early settler had struggled hard to found a new country, and many were the hardships he endured. We need not wonder then that so little attention was given to keeping the records of the less important industries, as that of the apple must have been.

INFLUENCE OF EARLY BOTANIC GARDENS

The early introduction and dissemination of apples throughout the country was materially aided through the establishment of botanic gardens that were conducted by private individuals interested in the horticultural development of the New World. These natural-born botanists constantly received productions from England and Europe, and tested and disseminated them to a wide extent in America. The Bartram Garden near Philadelphia was the first of these and was begun in 1728 by John Bartram, a horticulturist well known to the distinguished botanists of Europe. In 1773, a second garden was established at West Bradford, Penn., by Humphrey Marshall, and about the middle of the eighteenth century, William Prince founded a third, the Linnæan Botanic Garden at Flushing, Long Island. For several generations he and his descendants conducted the most extensive nurseries in the country, and much was accomplished through their enterprise.



FIG. 195.— MARKER ERECTED TO ORIGINAL NORTHERN SPY AT BLOOMFIELD,
ONTARIO COUNTY

On the tablet is engraved the following inscription: "The original Northern Spy apple tree stood about 14 rods south of this spot, in a seedling orchard planted by Herman Chapin about 1800. The Early Joe and Melon apples also originated in this orchard."

(*Photograph by Ontario Fruit-growers' Society.*)

Even in the time of Bartram, however, "great quantities" of apples were being exported, which we are told were superior in flavor to those produced in England and Italy. Without doubt the varieties introduced and disseminated were many, but history gives us no record of what they were nor to what extent the dissemination was carried on.

THE APPLE IN NEW YORK STATE

As the tide of immigration moved westward, the pioneers carried with them the fruit of their primitive homes to the frontiers of civilization. Not only did the apple keep pace with civilization, however; it even passed beyond the farthest outposts, for fruit and seed fell into the hands of the Indians and by them were carried into the wilderness. In this manner, the apple came into the possession of the Seneca and Cayuga Indians and in all probability of other tribes scattered here and there throughout the state. The Senecas and Cayugas were the most highly civilized, however, and their section was particularly well adapted to fruit growing, so that it was in this region almost entirely that General Sullivan saw apple orchards regularly laid out and bending with fruit during his raid into western New York in 1779. In that year, we are told, he found seventy apple trees at the Indian village of Kendaia, or Appleton (Apple Town), near Seneca Lake, in the west part of the town of Romulus, Seneca County. At this time the trees appeared to be fifty years old, which would make the date of planting as early as 1730. In a little book called "The Lake Country," by John Corbett, it is recorded that during his campaign Sullivan felled apple trees numbering into the thousands. This may have been true, because we have record of orchards having existed near the village of Levanna on Cayuga Lake, along what is now the south line of the town of Seneca Falls, and in Yates County, which lies a little to the south. The fruit of the trees in the orchard at Levanna was so choice that settlers came miles to cut grafts in order to provide orchards near their new homes, but for the most part the Indian trees bore poor fruit. In the region of Oswego the first orchard on record was planted by the Indians, and stood on the east bank of the Oswego River eight miles to the south of the present city. The early settlers bought the land and orchard from

the Indians in 1795. It was then in bearing and probably thirty or forty years old.

Orchards in Hudson River Valley Section

The introduction and growth of the apple industry was influenced by settlers in two distinct sections of New York State — in the eastern part, or Hudson River Valley section, and in the western part, or the Lake Section. The earliest apple orchard in the state dates back to the Dutch, and from the data available one may say that the beginning of the apple industry in New York was made by the Dutch, which leads us to a consideration of the Hudson Valley section first. A little further up the Hudson at Kinderhook, apples were planted by the Dutch over two hundred years ago, shortly after the country was settled. The majority were natural fruits and were used for making cider. They did not come into use for eating, cooking, and drying purposes until about 1830 to 1840.

Colonists from New England, settling on Long Island as early as 1640, set out their first apple trees about 1698, and within a few years some of these trees were still in existence and in fairly good condition. Later, in 1735, at this same section, the settlers planted orchards of Yellow Sweetings, Greenings, Russetts, and Pippins, which in all probability came from New England. Up along the Hudson, small orchards were planted by the English, who came from Long Island as early as 1750, and by 1770 there were settlers who were starting apple orchards near Amsterdam, but whether they came across from Connecticut or up from New York remains uncertain. A little later, about 1780, Thomas McClumphia settled at what is now Scotch Bush, just across the Mohawk River, south of Amsterdam, and planted an orchard there. Ten years later, the apple was introduced a little farther west along the Mohawk River near Clinton and New Hartford, which was at that time unbroken forest land. It is also recorded that in 1792 or 1793 an orchard was planted by D. S. Kirkland near Clinton, with seed that was brought from Connecticut. The original trees were seedlings that in 1820 were grafted to the improved varieties.

Coming down to the present time, we find that the more recent orchards in the Hudson River Valley district developed from a

small nursery started near Athens, Greene County, New York, in 1840, and a little later from another nursery near Hudson in Columbia County. Improved varieties were being extensively grown at this time, and the purpose of production had also changed. Instead of being used mostly for the production of cider, the time had come when apples were regarded as a staple farm crop, and commercial apple growing soon became popular.

The Work of Andrew J. and Charles Downing

The most important factor in influencing the fruit industry of the Hudson Valley region was probably the Downings' nursery at Newburgh and the untiring labors of A. J. Downing and his brother Charles. At what time the Downing nursery was started, I am unable to say. We know, however, that it was before 1815, since it is recorded that Charles Downing, who was born in 1802, worked in his father's nursery at the age of thirteen. In the early forties, A. J. Downing made a study of the common fruits with the purpose of giving a description of all varieties. Consequently new varieties were sent to him for identification or introduction, and in 1845 appeared his "Fruits and Fruit Trees of America." A. J. Downing died in 1852. Although the Downing brothers did not continue in the nursery business later than 1850, Charles Downing devoted himself to a life study of the varieties of fruits, on which subject he was the leading authority until his death in 1885. One can readily see that the work of the father and the two sons would greatly influence the apple industry in the Hudson Valley region.

Orchards in the Lake Section

In the western part, or lake section of the state, the first settlers planted apple seeds in the clearings, where they grew and produced seedlings and natural fruit. About 1830, when grafting was introduced, these trees were grafted to improved varieties. In many cases the union of the graft with the original stock can still readily be distinguished by the enlarged growth of the wood about three feet from the ground.

In western New York, the earliest record of the apple is found in Onondaga County, where Asa Danforth settled and, in 1748,

established a small nursery, from which apple trees and seedlings were rather widely disseminated. Fifty years later, another orchard was planted in Onondaga County, on what is now the farm of Grant Hutchings near Syracuse, by Gideon Seely, a surveyor employed by the state to lay out military tracts. Many of these trees are in bearing even now, and it is still possible to detect the union of the graft from the original tree to the improved varieties.



FIG. 196.—TABLET UNVEILED TO PRIMATE APPLE TREE IN TOWN OF CAMILLUS, ONONDAGA COUNTY, BY JOHN T. ROBERTS, SEPTEMBER, 1903

On the tablet is the following inscription: "On this farm Calvin D. Bingham, about 1840, produced the marvelous Primate apple, named by Charles P. Cowles. God's Earth is full of love to man."

In Seneca County, apple trees were planted by Dr. Alexander Coventry on a large farm in the northwest corner of the town of Fayette, but not long after, in the year 1792, Dr. Silas Halsey, of Long Island, settled at Ovid, and the same year, after procuring a quart of apple seed from an Indian orchard near Lodi Landing, he started a small nursery. In the same year still another orchard was planted at Ovid by Joseph Wilson, and shortly after Colonel Rynear Covert started one at Farmerville, now known as the village of Interlaken.

In the vicinity of Geneva, tradition tells us, several nurseries were established among the stumps left in the old Indian orchards after Sullivan's raid of 1779. One of these was started in 1792, on the farm of Nathan White, four miles west of Geneva, and in the year 1884 was still proving profitable. About 1880, settlers from New England took up farming just west of Geneva and there found new trees sprouted from orchards that Sullivan had burned. In these they inserted scions that they had brought with them, and later the trees were grafted to improved varieties. At about the same date an old Indian orchard that Sullivan had left untouched



FIG. 197.—INDIAN APPLE TREE, NEARLY 200 YEARS OLD, THAT STOOD UNTIL RECENTLY IN ORCHARD OF T. B. WILSON, HALL, N. Y.
(From "Apples of New York," by Professor S. A. Beach)

was discovered near Seneca Castle. A number of seedling trees of sufficient value to propagate were developed from this.

Near the New York State Experiment Station was still another orchard set out by the Indians in 1817. This was in full bearing up to the year 1867, but at that time was removed to plant a nursery.

The first orchard near Hall, New York, was developed on the farm of Edward Burrell about 1801 from seed said to have been

taken from natural fruit, found growing wild in the woods, but which had undoubtedly been scattered there by the Indians. In the orchard of T. B. Wilson, Hall, there stood until recently an apple tree said to have been planted by the Indians. Parts of the tree had been grafted to different species, and each year it bore four or five varieties. It 1896, it produced sixteen barrels of apples in all.

Near Waterloo apple orchards were set out about 1800, although the earliest settlers from Pennsylvania found Indian orchards and scattering trees there at that time. Even before this date Samuel Castner is recorded as having planted an orchard on his claim a little east of Penn Yan.

In the early days Tompkins County played an important role in the apple industry. We are told that in 1800 Nathaniel King, who lived at Trumansburg, returned to Dutchess County on horseback in order to obtain apple seeds with which to start a nursery. From the trees grown by him, about twenty orchards were planted in his neighborhood, ranging from forty to seventy-five trees each. Twenty to fifty years later, after grafting had been introduced, the trees were grafted to improved varieties, such as the Greening, Romanite, Sweet Bough, and King. Some time during the fifties, a nursery was started at Frog Pond, now Frontenac Beach on Cayuga Lake, and the trees were budded mostly to Kings, Greenings, and Baldwins. Of recent years the last trees of this nursery were set out as a large orchard near Trumansburg, and this is proving one of the best orchards in that section to-day.

In Wayne and Monroe counties the first orchards were planted about 1795, and in Orleans County a little later. In the latter county the earliest tree of which we have record was planted at the mouth of Johnson's Creek by a young girl named Rachel Lovell, and the wood of this tree is now preserved by the Pioneer Society of Orleans County. In the north of the county, orchards were set out on the bank of Johnson's Creek in 1807. The trees here are still standing and are in good condition. Another orchard was set out at Oak Orchard Creek about 1808, and still another at Holley in 1820. Among the varieties grown on the latter were the Greening and Russett, which had probably been brought from Long Island.

Near Barker, Niagara County, about 1810, seeds were planted by early settlers in favorable spots in the clearing, and were afterward grafted to improved varieties obtained from the former homes of pioneers from New York and New England. The plantings were small at first, perhaps little more than an acre, but after the Erie Canal became a popular highway for transportation, commerce increased and larger orchards were planted.

In 1880, Philemon Nettleton planted the first orchard in Genesee County, about two and one-half miles east of Le Roy village on the north side of the Albany Road, with seed brought from Connecticut. Two years later another settler brought with him enough seed to plant a nursery, and from this most of the early orchards of this vicinity were developed.

The early settlers about Dansville, Livingston County, originally came from the Wyoming Valley, Pennsylvania, and planted seeds about the year 1796. Other apple orchards were planted in the region of Batavia about 1804, from seeds brought from the New England States. They also brought with them a number of seedlings that were set out in orchards, this being the only instance recorded of settlers bringing young trees with them. These trees were later grafted to Baldwins, and are still standing, being in many cases three feet in diameter and nearly forty feet high.

In Chautauqua County apple growing began in 1805, when Judge Zatter Cushing moved from Paris Hill to Fredonia and brought with him one-half bushel of apple seed. From this he raised trees enough to set a twenty-acre orchard, containing 999 trees. Soon afterward, in 1897, Elijah Risley, sr., came to Fredonia from Hartford, Conn., and introduced several other varieties that proved superior to those brought by Judge Cushing.

In the north-central part of the state, very little attention is given to apple growing. The earliest trees were planted in Lewis County in 1805 by settlers from Massachusetts and Connecticut, but these produced practically all the apples in this section before 1850. About this time, and for many years after, large numbers of trees from the nurseries of western New York were planted, but very few survived. The St. Lawrence and the Tolman Sweet are about all that are left of these plantings.

The Work of Patrick Barry

Up to the present time we have touched only that phase of apple culture in western New York that was made by the early settlers. Their efforts were individual and scattered, not collected and systematic. About the middle of the nineteenth century, through the influence primarily of Patrick Barry of Rochester, apple growing in western New York began a new epoch. It was the time when scattered efforts were being systematized, individual struggles made collective, and apple growing began its new career on a commercial scale.

Patrick Barry was born at Belfast, Ireland, in 1816. He came to America at the age of twenty and after four years of service with the Prince's at Flushing, Long Island, founded in 1840 with George Ellwanger at Rochester, N. Y., the Mount Hope Nurseries. Ellwanger and Barry introduced fruit growing into western New York at a time when there were no railroads nor telegraphic facilities, nor any fast ocean steamers to bring over their importations from Europe. Mr. Barry did much to make Rochester a city of nurseries and western New York a famous fruit-growing region. The Western New York Horticultural Society, of which he was president for more than thirty years and until his death, has long exercised more than sectional influence. The work of Mr. Barry was truly national and essentially that of a pioneer. It is of interest to state that the work so ably inaugurated by him has been continued by his son, William Barry, who succeeded his father as president of the Western New York Horticultural Society, a position that he still holds.

APPLESEED JOHN AND THE APPLE IN THE WEST

The story of the spread of the apple westward is not unlike that of the history of its introduction into the New England Colonies and New York State. At first it was scattered in the west by Indians and the earliest pioneers. Chief among the latter was Johnny Appleseed, an eccentric character who carried appleseeds into the wilds of Ohio and Indiana and sowed them broadcast between the years 1801 and 1847. He was born in Boston in 1775, and his real name was Jonathan Chapman. For forty-six years he roamed the wilderness, sometimes clad only

in a coffee sack, remaining unharmed by snakes, Indians, and wild animals, and at the same time showing a like respect for them. In many frontier cabins he read aloud the New Testament and the teachings of Swedenborg, and his coming was everywhere welcomed. During his lifetime he saw his apple trees bearing fruit over a territory of 100,000 acres. Pruning and grafting he believed to be wicked, but his early work did much to advance the apple industry in the west. Readers of this bulletin who are interested in his work will enjoy reading the "Quest of John Chapman," by Rev. Newell Dwight Hillis, D. D., a novel, in which the leading character is Johnny Appleseed.

HISTORY OF CERTAIN WELL-KNOWN VARIETIES

The history of the origin and propagation of some of the best-known varieties in New York State is most interesting, and is deserving of mention when we consider how much the apple has done for our state.

Baldwin.—Perhaps no other apple deserves a higher place among its fellows than does the Baldwin, and certainly no other apple has so molded the fortunes of fruit growers. There are several accounts of its origin and introduction, one of which was written in 1835, by Rufus Kettredge of Portsmouth, Mass., for the *Horticultural Magazine*. It reads in part as follows: "The original tree grew on the farm of my grandfather, Mr. John Ball, formerly of Tewksbury, Mass. The farm was situated one and one-half miles south of the Merrimac River, and three miles south-east of Lowell. * * * My father, the late Dr. Benjamin Kettredge of Tewksbury * * * said that it was not engrafted, as no person at that time in Tewksbury was acquainted with grafting; that it was, to use his expression, 'the mother of them all.' * * * This apple was confined to that neighborhood for many years when the late Colonel Baldwin of Woburn became acquainted with it." The *Country Gentleman*, May 27, 1880, gives the following rather different account: "Mr. Chas. Brooks says the first tree grew on the hillside within two rods of the former Woburn line on the farm of Mrs. Thompson. Around its trunk the woodpecker had drilled circles of holes, and from this peculiarity, the apples were called Peckers. Colonel



FIG. 198.—GRANITE SHAFT COMMEMORATING THE BALDWIN APPLE IN THE TOWNSHIP OF WILMINGTON, MASSACHUSETTS. ERECTED BY THE RUMFORD HISTORICAL ASSOCIATION OF WOBURN, MASS.

(Courtesy of Professor F. C. Sears, Massachusetts Agricultural College, Amherst, Mass.)

Baldwin in passing the woodpecker tree when a boy was attracted by its tempting red apples, and years afterward took some of the scions from the tree to a public nursery for propagation, from which circumstance they received his name. The original tree was destroyed in a violent gale in September, 1815."

There are still further traditions regarding the discovery of the tree, but all agree on the fact that it was brought into prominence by Colonel Baldwin. Of recent years the Rumford Historical Association of Woburn has erected a granite shaft on the spot where the Baldwin was discovered.

Northern Spy.—The Spy originated on the farm of Heman Chapin in the town of East Bloomfield, where he settled about the year 1800. From Connecticut apple seeds he raised his trees, which were grafted to standard varieties, and in this orchard the Northern Spy originated. Ellwanger and Barry, nurserymen of Rochester, procured buds, and through them the apple was first disseminated.

King of Tompkins County.—The Tompkins County King originated in the orchard of Mr. Harrison in Essex County, New Jersey, and was named by Mr. Letts the King apple. Mr. Letts moved to Tompkins County in the year 1800, and in 1806 procured some scions from his favorite tree, a number of which he set for Jacob Wycoff of Jacksonville, town of Ulysses, and the remainder for himself. Those he set for himself died within the year, as did also the original tree in New Jersey. Only one of the scions set for Mr. Wycoff lived, and thus one graft was left to fill the world with one of the most beautiful and best apples known.

Rhode Island Greening.—The locality of the origin of the Rhode Island Greening is considerably disputed, but the best evidence indicates that it originated in the state of Rhode Island, in the vicinity of Newport, where in olden times a tavern-keeper by the name of Green raised apple trees from seed. Scions of one of the trees that produced a particularly good apple were in such demand by guests at the tavern that the tree died from exhaustion. Another Greening tree, which is supposed by some to be the original tree, still stands in the town of Foster at Mt. Hygeia. It has borne fruit uninterruptedly until within the last

few years and must be nearly 200 years old. There are also authentic records* of other old Greening trees that are at least 150 years old. This fruit has always been a favorite in New York State. Although we do not know the facts of the history of its introduction, it is certain that it had become widely disseminated in New York during the eighteenth century.



FIG. 199.—ANCIENT RHODE ISLAND GREENING TREE, ABOUT 200 YEARS OLD, THAT STOOD UNTIL RECENTLY IN TOWN OF FOSTER, R. I., NEAR HYGEIA

(From Bailey's "New Cyclopedia of American Horticulture." Courtesy, The Macmillan Company.)

MONUMENTS TO ORIGINAL VARIETIES

During recent years fruit growers of this region have shown a desire to preserve even the most fragmentary data relative to the early orchards planted in this country by the first settlers from the Old World, and in several instances they have manifested their appreciation of the struggle that our forefathers endured in establishing our Nation in prosperity and fruitfulness, by erecting monuments on the spot where certain of our choicest varieties of apple trees originated. We have already referred to the granite shaft erected in 1895 by the Rumford Historical Association of Woburn, Mass., to the Baldwin apple, and have information of another unveiled to the McIntosh Red by the farmers of Dundas County at Dundela, Ontario, Canada, in 1912. The origin of the Wealthy apple, a leading variety of the Mississippi Valley, is likewise commemorated by a tablet dedicated in

* Apples of New York, Vol. I, p. 286.

1912 to the memory of Peter M. Gideon, of Excelsior, Minnesota. In our own state there exist two such acknowledgments of our debt to the past and our gratefulness for Nature's bounty, concerning which the following information is found in Bailey's *Standard Cyclopaedia of Horticulture*, together with sketches of the monuments in question: "The first tablet in New York State in memory of any apple was erected in the town of Camillus, Onondaga County, on the original site of the Primate apple tree. John T. Roberts, Syracuse, on September 11, 1903, caused a bronze tablet to be erected there. On this tablet is the following



FIG. 200.—BLOCK OF GRANITE COMMEMORATING THE WEALTHY APPLE ON BOULEVARD LEADING TO MINNETONKA BEACH, NEAR EXCELSIOR, MINNESOTA

The following inscription appears on the bronze tablet: "This tablet commemorates Peter M. Gideon who grew the original Wealthy apple tree from seed on this, his homestead, in 1846. Erected by the Native Sons of Minnesota, June, 1912."

(From Bailey's "Standard Cyclopaedia of Horticulture."
Courtesy, The Macmillan Company.)

inscription: 'On this farm Calvin D. Bingham, about 1840, produced the marvelous Primate apple, named by Charles P. Cowles. God's Earth is full of love to man.'

"A second marker was erected in New York in 1912 to the Northern Spy, Early Joe and Melon apples, at Bloomfield, by the Ontario County Fruit-Growers' Society, with the following tablet: 'The original Northern Spy apple tree stood about 14 rods south of this spot, in a seedling orchard planted by Herman Chapin about 1800. The Early Joe and Melon apples also originated in this orchard.'"

THE APPLES OF NEW YORK

PROFESSOR S. A. BEACH

Horticulturist, State College of Agriculture, Ames, Iowa

(Formerly horticulturist at the New York Agricultural Experiment Station and author of "The Apples of New York.")



Apples constitute the most important fruit crop of the Empire State. They are grown to a greater or less extent in nearly all of the farming regions from Montauk Point to the Niagara River and from Rouses Point to Chautauqua Lake. They are found on nearly every farm and also about many of the homes in the smaller cities, towns, villages and suburban districts. Every year they yield a delicious, appetizing and healthful article of food for all classes of people at moderate ex-

pense, and at the same time give to a large percentage of the agricultural population profitable employment for capital and labor, and to the state a desirable diversification of its agricultural industries.

New York is unexcelled in the abundance, variety, and excellence of the apples which it produces. If all the apple trees of New York were wiped out of existence so that the people would be compelled to secure their supplies of this fruit from other states and from foreign countries, apples would become a high-priced luxury. New Yorkers would then begin to appreciate as never before this queen of fruits, and the place which it fills in their agricultural and domestic economy. But with apples so common as they now are, their real worth is altogether too lightly esteemed.

The constant increase of population, the development of transportation and other facilities, with the more general adoption of improved methods of grading, picking and marketing, may naturally be expected to result in a constantly increasing demand for good New York apples at remunerative prices. A survey of

the orchards of the state indicates that many of the bearing trees have passed their prime and that each year their number grows less. It is questionable whether for many years to come the decrease in the number of bearing trees will not be greater than the increase in orchard planting. It appears, therefore, that under right methods of orchard management and with the proper selection of varieties, the planting of commercial orchards offers an attractive investment for the New York fruit grower.

The question as to what varieties to plant is, therefore, one of perennial interest. It shall be the purpose of this paper to sketch briefly the various pomological districts of New York State with particular reference to the varieties of apples which have come to be recognized in each as desirable for commercial planting. Brief mention will also be made of the kinds that are suitable for the home orchard or local market.

WESTERN NEW YORK

The most important apple region of the state is that which extends from the shores of Lake Ontario and Lake Erie southward to the Pennsylvania line. Its eastern border includes the counties in which are located the cities of Oswego, Syracuse, Auburn, Ithaca, and Elmira. The more elevated portions may be regarded as the northward extension of the Alleghany Plateau and for convenience will here be designated as the Western Plateau of New York State. This descends into the less elevated region which includes the Central Lakes, sometimes called the Finger Lakes, and the middle of the Genesee Valley. Westward is the plain of the Erie shore and northward the plain of the Ontario shore.

According to the last United States census report, this western New York region includes about 60 per cent of the bearing apple trees found in New York State, and in the census year of 1909 it yielded 68 per cent of the apple crop of the state, or approximately 17,308,000 bushels, out of a total of 25,409,000 bushels. The region along the Lake Ontario shore, lying between the Oswego River on the east and the Niagara on the west, leads in the relative amount of land devoted to apple growing and also in the yield of apples as compared with its total area. In 1909 it produced approximately eleven million bushels of apples. Next in



FIG. 201.—MAP SHOWING THE APPLE-GROWING DISTRICTS OF NEW YORK STATE.

rank comes the Central Lake and Genesee region, followed closely by the Erie Plain, while last in importance are the counties which form the eastern and southern border of the western New York region as above outlined. The accompanying map shows the distribution of bearing apple trees in this and other portions of New York. Each dot represents 10,000 trees.

Leading Varieties

Among the varieties grown in western New York the Baldwin stands far in the lead. Probably more of this fruit is put upon the market than of all other apples put together. Rhode Island Greening ranks second. These two varieties supply not less than two-thirds of the apples produced in western New York. In fact the same may be said for the entire state. Third in general importance comes Northern Spy. Among others worthy of mention as commercial varieties are: Tompkins King, Roxbury, Golden Russet, Hubbardston, Nonesuch, Twenty Ounce, Pumpkin Sweet or Pound Sweet, Fall Pippin, Maiden Blush, McIntosh, and Duchess of Oldenburg. The value of these kinds for commercial planting in western New York is not problematical. It has been thoroughly demonstrated by years of experience.

Generally speaking, those who contemplate planting commercial orchards in this region would best not go outside of this list for their selections without giving the subject very careful consideration. For local or for special markets, or in special localities, other kinds might be found equally satisfactory. Among those worthy of consideration in this connection may be named such old kinds as Alexander and Wealthy for fall, Black Gilliflower, Ben Davis and its sports Gano, and Black Ben Davis, Westfield Seek-No-Further, Tolman Sweet, Swaar, and Rome Beauty; and among newer sorts Delicious, King David, and the highly colored types of Twenty Ounce known as Collamer and Hitchings.

It has not yet been demonstrated that Delicious is a sufficiently reliable cropper to be profitable for commercial planting in New York. Its high dessert flavor doubtless would insure for it good market prices. King David has not as yet made a reputation in market and its orchard characteristics have not been proven in

New York State. When well grown it is a beautiful apple, but it is rather sharply flavored. Rome Beauty has done well in certain locations, particularly on the lighter loams, where it takes on good color and is of good size, fair and smooth. Its foliage often suffers injury from scab. The tree is an early and reliable cropper; the fruit has an established reputation in market, and keeps well, but is inferior in quality to Baldwin. Rome Beauty is a better variety for Long Island, New Jersey, Southern Ohio, and corresponding regions than it is for general planting in western New York.

The list from which selections may be made for amateur purposes, for home use, and under special conditions for commercial orchard planting, may be enlarged so as to include Yellow Transparent, Primate, Early Harvest, Early Joe, Early Strawberry, Red June, and Bough Sweet for summer; Late Strawberry, also known as Autumn or Fall Strawberry, Gravenstein, Chenango Strawberry, Golden or York Pippin for fall; Esopus Spitzenburg, Norton Melon, Hyde King, Bailey Sweet, Lady Sweet, Sweet Winesap or Hendrick Sweet, and Jacob Sweet for winter.

EASTERN NEW YORK

In eastern, as in western New York, Baldwin, Rhode Island Greening, and Northern Spy are the leading commercial varieties, with the Spy here showing a relatively higher rank than it does in the western districts. Other kinds of importance are Hubbardston, Esopus Spitzenburg, Yellow Newtown Pippin, Green Newtown Pippin, Jonathan, Rome Beauty, Dutchess of Oldenburg, Gravenstein, Maiden Blush, and Ben Davis. Prospective planters in eastern New York would do well to confine their selections principally to three or four kinds selected from the list just given. It is recognized, however, that on account of the advantage of proximity to large markets it may often be profitable to grow a greater variety with approximately more of summer and fall apples in some parts of this region than would be generally advisable in other regions more remote from market or from good transportation facilities.

The newer varieties mentioned in the western New York list may be put on trial in eastern New York, but the conservative

fruit grower will not plant them largely until their value for this particular region has been more fully proven.

LONG ISLAND

Long Island has the climatic conditions of a low coastal plain. Its lighter sandy or sandy loam soils, especially when overlying sandy or gravelly subsoils, are not well adapted to commercial apple growing. It is generally recognized that the apple thrives best where there is a noticeable admixture of clay in the loam or in the subsoil, or both. On such soils, apples thrive on Long Island.

Leading Varieties

The varieties named for the Hudson Valley generally do well on Long Island. Such kinds as the Newtown Pippin, which originated here; Esopus Spitzenburg and its daughter Jonathan, both of which originated on the Hudson; Rhode Island Greening, which had its origin in Rhode Island; Maiden Blush, which hails from New Jersey; Rome Beauty, Grimes Golden, Red Astrachan, Duchess of Oldenburg, and Yellow Transparent — are all worthy of consideration in making up a planting list for the Long Island commercial orchard. The list may be extended for home orchards or for amateur purposes so as to include other kinds of peculiar merit for either culinary or dessert use; such as, Bullock or American Golden Russet, Long Island Russet, Black Gilliflower, Collamer Twenty Ounce, Hitchings Twenty Ounce, Bough Sweet, Pumpkin Sweet, Lady Sweet, Jersey Sweet, Fall Pippin, Jacob Sweet, Summer Queen, Gravenstein, Delicious, Winter Banana, Opalescent, and Yellow Bellflower.

NORTHERN NEW YORK

The northern New York region is bounded on the south by the Mohawk Valley district. It includes the Northern Plateau with the Adirondack Mountains and their foothills, in each of which are found the lower lying valleys of the Upper Hudson and of Lake Champlain, while to the north and west lies the valley of the St. Lawrence River and Lake Ontario. Northern New York includes the highest and coldest districts of the state,

where none but the very hardiest apples and crab apples should be planted. In such locations the list from which selection should be made includes such crab apples as the Hyslop, Transcendant, Martha, Whitney, and Gibb, and the hardiest of apples such as Hibernial, Antonovka, and the best of the hybrids which have been originated by the Central Experiment Farms, Ottawa, Canada. Hibernial is of value only as a kitchen apple. It is perhaps the hardiest large-fruited apple known to American pomology. Antonovka, when fully ripe and mellow, would be classed good for dessert use; for culinary use it is decidedly superior to Wealthy. It is hardier than Wealthy in tree and ripens a little earlier. The tree is a reliable cropper. It deserves to be planted more frequently in the colder districts of the state both for home use and for local market.

In those parts of northern New York where the climate is less severe, the list for commercial planting should include Yellow Transparent, Duchess of Oldenburg and its daughters Okebena and Dudley, for late summer and early fall; Alexander, Wolf River, Wealthy, Fameuse, McIntosh, and Canada Baldwin for autumn and early winter. Brilliant should be put on trial for both commercial and home use. The list for the home orchard should include such hardy sorts as Blue Pearmain, Westfield Seek-No-Further, Nodhead, Bethel, Oel Austin, Windsor, Malinda and Tolman Sweet. For the lower elevations along Lake Champlain and the valley of the St. Lawrence and Lake Ontario, where commercial orcharding is less hazardous than it is in the colder districts which we have been considering, the list for commercial planting may include Duchess of Oldenburg, Wealthy, Fameuse, and McIntosh, with Brilliant for trial; and in especially favored localities, Northern Spy, Westfield Seek-No-Further, and also possibly Baldwin and Rhode Island Greening, where top-worked on such hardy stocks as Northern Spy or Tolman Sweet.

The residents of northern New York would do well to keep in touch with the splendid work in breeding hardy apples for northern regions that is being conducted by the Canadian government at its experiment farms. Information concerning the results that have already been secured in this work may readily be

obtained by addressing Professor W. T. Macoun, Dominion Horticulturist, Ottawa, Canada.

Description of most of the varieties named in this article may be found in the two-volume work entitled, "The Apples of New York" published by the Department of Agriculture at Albany, and in the excellent bulletins by Professors U. P. Hedrick and O. M. Taylor, and their associates, which have been issued by the State Experiment Station at Geneva, New York.

SOIL TYPES FOR VARIETIES OF APPLES

H. J. WILDER

State Relations Service, U. S. Department of Agriculture,
Washington, D. C.

GENERAL SOIL SELECTION



In choosing a soil for planting an apple orchard there are certain general characteristics that are of fundamental importance for all varieties, and these should be considered before trying more specifically to select soils particularly well adapted to the different varieties.

The soil should be deep and well drained for all tree fruits, and for apples, at least, it should also be productive or capable of being made productive economically. The soil may be deep and well drained without being sandy. Good loams, for example, may be not only deep and well drained, but also productive.

The presence of unbroken rock, large ledges, or hardpan, within three feet of the surface, should be considered prohibitive. A soil depth of at least six feet is highly desirable, soils with the underlying rock too near the surface having been responsible not infrequently for the failure of commercial orchards in some sections of the country. The injury from shallow subsoils is due primarily to the incapacity of the subsoil, on account of its limited volume, to store sufficient moisture for the needs of the trees when droughty conditions prevail, or to get rid of excess moisture quickly enough. Some subsoils devoid of stones are so clayey in texture or stiff in structure that drainage is very inferior. If, on the other hand, soils and subsoils of favorable texture and structure have been selected, the presence of loose stones in the subsoil in distinction from underlying rock does no harm unless sufficiently numerous to interfere appreciably with the upward capillary movement of the soil moisture. But when soils have been advantageously selected with reference to their textural and structural adaption

to fruit trees, there is no virtue in the presence of stones, popular opinion as often expressed notwithstanding.

The not uncommon statement that stones conserve moisture in the soil because it condenses on their under surface is somewhat misleading, for the amount so condensed is not sufficient to lessen either the cultivation or the mulching necessary in these respective methods of orchard management. In neglected orchards where neither cultivation nor efficient mulching is practiced, stones doubtless assist a little in conserving moisture.

It should be borne in mind that hillsides and slopes from which surface drainage is adequate, or even too rapid, may have very inferior subsoil drainage. This condition is not infrequently found in New York, particularly in the southern part of the state where the Volusia silt loam prevails, or wherever there is bed rock of shale. With care it is usually possible to avoid such sites for orchards. If water seeps out to the surface on the lower part of a slope, caution should be observed. Often the upper part of a slope is much better drained than the lower part.

The term hardpan is in common use to designate a subsoil condition which delays the ready percolation of moisture. Its common use, however, has led to marked misunderstanding — at least in the eastern states — as it unfortunately includes everything ranging from true hardpan to a clay loam, which may constitute a desirable subsoil for orchard purposes. A true hardpan consists, not of a subsoil containing sufficient clay to make it retentive of moisture, but of a mixture of sand, gravel, silt, and clay, with more or less cementing material which so binds these ingredients together that the movement of soil moisture either downward or upward is seriously impeded; or, a hardpan may consist of a thin layer of material matter formed by deposition of salts of iron, lime or other minerals in solution after the formation of the soil or during the process. Such conditions within several feet of the surface are very undesirable. The percentage of such hardpan areas is not great. It is probable that they may be remedied by dynamite used in sufficient quantities to break up the hardpan effectively, this to be followed and supplemented by the use of deep-rooted leguminous cover crops to keep the shattered hardpan friable, but, until the price of naturally good orchard land in

the East is much higher than now, it is unquestionably better economics to select soils which do not need the dynamite treatment to render them fit for planting fruit trees. Where the subsoil is impervious in an orchard already planted, and drainage consequently defective, tile drains, though involving considerable expense, are the best remedy. Evaporation of excess moisture may also be increased by non-cultivation or by transpiration through growing a crop. Conversely, if the soil tends to dry out too quickly, cultivation should be frequent, and a good supply of humus should be maintained to conserve the moisture. While such manipulation of method to suit the circumstances in the individual orchards should constantly be made use of, it has its limitations and does not at all do away with the desirability of selecting the soils best adapted to the individual variety; namely, those soils which will require a minimum of manipulation to effect the best soil environment.

Detailed study shows that in highly developed localities where climate, transportation facilities and local markets are the same, the different varieties of apples are usually not equally well grown on all soils, and consequently that a given variety of commercial worth is not necessarily of equal desirability for all growers or all soils in the same locality. Descriptions of soils favorable to the growth of certain varieties follow.

RHODE ISLAND GREENING SOILS

A surface soil of heavy silty loam or light silty clay loam with similar subsoil excels for the "green" Rhode Island Greening. Such soil will retain sufficient moisture to be classed as a moist soil, yet is not so heavy as ever to be ill-drained, if surface drainage is adequate. The soil should be moderately rich in organic matter. In the region where this apple is commercially grown, such soils are generally grayish rather than brownish in color, but this characteristic does not always follow. A medium to heavy friable, well-oxidized, brown loam, with subsoil of same character or a little heavier, is more favorable to a moderate blush, and in New England gives a good quality of fruit for all purposes except the commercial market.

In the Germantown District, of Columbia County, where heavy

soils predominate, fifteen years is usually given as the age at which this variety comes into bearing; but, in the Kinderhook section of sandy soils at the north end of the county, ten years is the estimate. Yet there is much more enthusiasm in growing Greening in the locality of heavy soils, and many more are being planted than where the sandy soils prevail, notwithstanding its later bearing on the former.

In a number of excellent commercial orchards that sell Greenings from sandy soils, both in the Hudson Valley and along Lake Ontario, it was found on checking conditions at harvest time that the ability to sell such fruit was due solely to picking the apples while still so immature that the objectionable yellowing had not had time to develop, and even then a yellow blush was rapidly developing. In some cases in 1913, the fruit was picked long before it had reached full size. It is common practice on sandy soils to try to hold off yellowing by continued cultivation, increasing the supply of organic matter, or even by applying nitrogenous fertilizer.

Limited space forbids the description of results in any number of individual orchards, but a characteristic one in Ontario County may be mentioned. On heavy loam, silt loam, and silty clay loam surface soils with subsoils of about the same texture, Rhode Island Greening acquires good size and matures with green color — thus meeting the general market requirements — and it is profitable. On the same soils Baldwin is deficient in color, even though tile drains have been installed for a period of several years. This is an illustration of the fact that tile drains are not sufficient to make a typical Greening soil equally well adapted to the Baldwin.

In a northeast Monroe County orchard, fruit on heavy soil is very green if picked at the customary time for the neighborhood. The owner will not pick when immature, however, but leaves them on the trees until most people harvest Baldwins. On his heavy soil this can be done without any great loss from dropping, but by leaving them so late some blush appears. Such fruit is of good quality, keeps very late, and is less subject to scald than when picked immature. On sandy soil it has to be picked while immature to prevent dropping, and this brings it into the late fall apple class.

The primary demand of the New York market is still for Rhode Island Greening "as green as grass," and leading dealers and commission men there state that "any means or factor which will give them a Greening of such color, that is larger, nearer maturity, and that can be picked later, is greatly to be desired." Late maturing or clayey soils certainly help to this end.

BALDWIN SOILS

The best Baldwin soils consist of heavy fine sandy loams, and light mellow loams, underlain by deep subsoils ranging from plastic, light clay loam to heavy silt loam. The soils should be well oxidized, the brown and yellow colors being more satisfactory than the gray.

Light sands give a high color to Baldwin, but on them the fruit matures early and in most years tends to be undersized. Plenty of humus helps to overcome this, but it should not be supplied through too great amounts either of stable manure or of green crops plowed down in any one year. No more manure should be applied at one time than will become thoroughly disintegrated and incorporated with the soil in one year. If applied in too great amounts the soil may be made more droughty the first year; but moderate annual applications increase the moisture-holding capacity of the soils, and thus slightly defer the maturity of crops.

The same principle applies to the plowing under of cover crops, which should never be done unless the soil is sufficiently moist to cause their ready decay. Otherwise they may form at the bottom of the furrow a barrier to the upward movement of the capillary moisture. If the soil is dry the cover crop should be mowed and left to serve as mulch until rains come to moisten the soil deeply. If it is then too late in the season for plowing to be advisable, this should be deferred until the following spring.

Heavy silt loams and clay loams are not favorable to high color on Baldwin, and in some sections of New York are to a considerable degree responsible for fruit with poor color. Such fruit may keep well but it does not appear attractive on the market. Tile drains and heavy cover crops to reduce the soil moisture afford some alleviation to this condition.

NORTHERN SPY SOILS

The soil requirements of Northern Spy are more exacting than with many other varieties and apparently are best supplied by a medium loam underlain by a heavy or light clay loam — that is, a soil as heavy as can be selected without incurring the danger of inferior drainage, for a poorly drained soil should never be used. It should not be planted on a soil lighter than a very heavy fine sandy loam underlain by a light, friable clay loam, or possibly a heavy loam, and the soil should be deep. Good air drainage and good elevation are also very essential with Northern Spy.

On light sandy soils Spy usually has excellent color, but the fruit tends to soften early. Not infrequently, on the Lake Plain in Western New York, Spy is said to do well on sandy soils, but in most cases of this kind a stratum of heavy soil is found within three or four feet of the surface, which gives the soil a much greater moisture-holding capacity than is possessed by a deep sand.

HUBBARDSTON SOILS

A rich, fine, sandy loam soil, with subsoil of similar texture, excels for the Hubbardston. A subsoil containing enough clay to make the fine sandy material somewhat coherent, or sticky, is not objectionable; but there should never be enough clay present to render the subsoil heavy.

SUTTON SOILS

Sutton should be grown on soils as described for the Hubbards-ton. The trees have so much less bearing surface than more vigorous growing sorts such as Baldwin, or even its sister variety, the Hubbardston, that the yield is relatively low, and few continue to plant it. If it is to be sold to advantage, special marketing also is often necessary.

MCINTOSH SOILS

For this variety, soils ranging from heavy, sandy loam to medium loam with subsoil of light, friable clay loam seem to give the best results. If good size is to be maintained on sandy soils in dry seasons, a plentiful supply of decayed vegetable matter in the soil is necessary.

Jonathan, Tompkins King, and Grimes are all grown to advantage on mellow medium loam with subsoil of friable loam. Jonathan needs excellent care with heavy fertilization, and will

stand good applications of stable manure. With all these conditions supplied, it has given excellent results in some cases. Tompkins King readily succumbs on low moist ground, and it has rarely proved satisfactory on its own stock, the opinion prevailing that it should be top-worked on Northern Spy or Tolman. With ordinary care Grimes, as well as Jonathan, is undersized, and should not be planted as a commercial sort. With intensive methods, however, satisfactory size is secured, and in one orchard in the Hudson Valley the fruit was large in the season of 1913.

TWENTY OUNCE SOILS

On deep sandy loams or very light friable loams with subsoils not heavier than light friable loams, the Twenty Ounce is most successful. On the Ontario Plain it is also well grown on light, sandy loams and fine sands which have been kept well supplied with decayed vegetable matter.

OLDENBURG, WEALTHY, AND WAGENER SOILS

For Oldenburg, heavy sandy loams and very light mellow loams with subsoil of sandy loam have given good results. For Wealthy the same soils are desirable, though the subsoil may also be a little heavier loam. Even then the variety usually needs thinning. Both these soils are suitable for Wagener, but they should be in even more productive condition than is essential for Oldenburg or Wealthy. On account of its weak growing habit, the tree is quickly affected by droughty conditions; hence, a plentiful supply of decayed vegetable matter in the soil is essential.

BEN DAVIS SOILS

This variety has usually been highly profitable, but many are fearful of future markets for it; and, as several other varieties of better quality are nearly as profitable, few commercial growers seem now ready to plant more Ben Davis, except to fill in blocks of orchard where the soil or drainage is unfavorable. For this latter purpose it is frequently used, and its tendency to bear annually more than most varieties is a point in its favor. Deep and well-drained soils favor a high color of Ben Davis apples, as well as other red varieties; but, as Ben Davis is grown for quantity rather than quality, poor color possibly detracts less from its sale price than with some other sorts.

TILLAGE

W. H. CHANDLER

Professor of Research in Pomology, Cornell University, Ithaca, N. Y.



Experimental evidence and practical experience point strongly to the conclusion that under nearly all circumstances the best method of handling an orchard soil is by a combination of annual tillage with a cover crop. There may be marked exceptions under special conditions, and results of some brief experiments indicate that other methods of handling the soil may give equally good results; but, until these results are fortified by further experience, it seems wise to advise the use of tillage

combined with a cover crop in nearly all cases.

Concerning the methods of tillage and the seasons when tillage gives best results, or when failure to cultivate would do the least harm, and when the cover crop should be sown, there is less positive evidence. Yet, from some practical experience and from our knowledge of tree growth, it seems safe to advise that the time of plowing the land in the spring and the time of sowing the cover crop, should be earlier than is the common practice. If any treatment that is expected to increase the vigor of the tree is to have great influence during the current season, that treatment must be given early, because tree growth takes place during the early part of the season. It is certain that conditions for growth during the first two or three months of the growing season determine the size of leaves on any but the very youngest trees. In many cases, where a cover crop is plowed under, say in June, it will be difficult to observe any good effect from that plowing upon the current season's growth. This is particularly true in a soil that is not retentive of moisture.

If the soil is plowed very early in the spring, it is obvious that there can be little spring growth of the cover crop. It will be necessary, therefore, to sow the cover crop early enough that it will make sufficient growth before winter. Then, in some cases,

it is well to have the cover crop sown early in order that its competition with the trees in the soil may insure earlier maturity. The tree may thus be in better condition to survive a severe winter. On the other hand, it is evident that the competition of this cover crop may possibly at times so reduce the moisture supply as to interfere with the largest development of the fruit. Under New York conditions, however, it is probable that this would not happen very often. This will be discussed more fully later.

KINDS OF COVER CROP

It is not the purpose of this paper to go deeply into the subject of cover crops, but only to discuss them in their relation to



FIG. 202.—COVER CROP OF RED CLOVER IN PEACH ORCHARD OF J. H. TEATS' SONS, WILLIAMSON, N. Y.

tillage. However, it may be well to mention a few of the better cover crops, as well as some of the requirements for a good cover crop.

The chief purposes of a cover crop are, to supply humus when plowed under, and, by its growth in the soil, to reduce the moisture

supply late in the season and check the growth of the trees, insuring satisfactory maturity. Any crop, therefore, that can be sown as late as July 1 to August 20, and will yet make a reasonably good growth before time to plow it under the following spring, may be considered useful as a cover crop. Some of the crops that may be expected to make a good growth during the summer and autumn seasons are: oats, or a mixture of oats and Canada peas; buckwheat, or a mixture of buckwheat and Canada peas; dwarf essex rape; cowhorn turnips. It is of some advantage to have the cover crop live through the winter, since it will then remove moisture from the soil somewhat rapidly in the spring and make it possible to plow the ground earlier than could otherwise be done. Among the crops most satisfactory from this standpoint are: rye; winter vetch; and, in some cases, crimson clover. Dwarf essex rape will sometimes live through the winter.

It is also an advantage if the cover crop be one of the legumes, so that it may furnish nitrogen as well as humus to the soil. Perhaps winter vetch may be mentioned as the most satisfactory cover crop of this type. The only important objection to it is the cost of the seed, but this may be grown by the orchardist. Red clover is coming to be used to a large extent in parts of New York. Canada peas may also be mentioned in this class. Crimson clover is sometimes used successfully, though it is very often a failure and will not usually be satisfactory north of New Jersey.

Soil conditions are important determining factors in choosing a cover crop. Thus, dwarf essex rape seems to make about the best growth on a very heavy soil. Crimson clover can generally be expected to grow successfully only in sandy soil. Winter vetch, rye, Canada peas, and oats are satisfactory for a very great variety of soils. Red clover does not give satisfactory results in an acid soil, so some growers find that it is best to use lime in order to get a good cover crop of red clover, even though the trees may not show much response to the use of lime.

RELATION OF TILLAGE TO WINTER INJURY

Since the nature and time of tillage would generally influence so markedly the condition of growth, it would be expected also to influence greatly the amount of winter injury. It should be said

that, taking this state as a whole, the amount of winter injury is rather large. It is true that the amount of winter injury or the number of trees killed or injured in an orchard is likely to be rather small in any one year. However, when a few trees are injured each year, or every two or three years, it does not take long for enough to be injured to reduce greatly the yield of the orchard.

There are very many forms of winter injury to be observed in this state; in fact, the prevailing type of injury is likely to be different on almost every year. Some of the most common forms



FIG. 203.—COVER CROP OF RED CLOVER, WITH THE WILD GRASS THAT NECESSARILY GROWS AFTER CULTIVATION CEASES, IN YOUNG ORCHARD OF MR. F. W. CORNWALL, PULTNEYVILLE, N. Y.

Mr. Cornwall practices very early plowing in the spring, sometimes beginning to plow before all the frost is out of the ground. He then sows his cover crop late in June or early in July.

are: killing back of twigs; killing of small areas of tissue in the bud so that the starting of the bud is often delayed, even when the bud is not killed; killing around the base of the tree just above the surface of the soil, or even just below the surface of the soil. In practically all of these forms of killing, except in the colder portions of the state, the condition of the tree as it goes into winter seems to determine the amount of injury. If the tree has ceased growth and the wood has become firm rather early, then the danger

from winter injury is greatly reduced. In many cases the last tissue to reach this condition of maturity is that just above the surface of the soil. It should not be inferred, however, that a weak growth necessarily insures great hardiness. If the tree has made a very weak growth during the early portion of the season and this is followed by rather wet weather during the latter portion, then the tree is likely to start a late succulent growth that



FIG. 204.—BUCKWHEAT AS A COVER CROP IN A YOUNG PEAR ORCHARD BELONGING TO THE DEPARTMENT OF POMOLOGY, NEW YORK STATE COLLEGE OF AGRICULTURE, ITHACA, N. Y.

The buckwheat was sown on June 29. Pear trees are peculiarly susceptible to early winter injury. In spite of the very wet season, these trees are going into winter with the wood very well ripened on account of the early sowing of the cover crop.

will leave it very tender when winter comes on. Vigorous growth early in the season — in the case of any but the very youngest trees, at least — is a protection against such late succulent growth. When the tree has made a vigorous early growth it is likely to have leaf surface enough to dispose of the extra supply of water late in the season without causing renewed growth. This is particularly true

if the cover crop is sown early to assist in using the extra supply of moisture. Briefly, then, the means by which the tree can be brought into winter in the hardiest condition are, to have an early growth, such as would likely follow early plowing under of the cover crop in the spring, with a cover crop sown early enough so that its competition will insure the tree against excessive growth late in the season. If the soil is plowed as early as possible in the spring and the cover crop is sown in July, it is very probable that more growth will be secured than if both be done a month later. Yet, with the early plowing and early sowing of the cover crop, one can be much more certain that the wood will be well ripened for winter.

CULTIVATION OF YOUNG TREES

In the case of a very young orchard, it is generally wise to grow an intercrop—a crop to be harvested from between the trees. The cultivation, then, will be partially determined by the nature of the intercrop. If the orchard is growing in a section where it is possible to make good profits from the intercrop, it may even be wise to sacrifice to some extent the best interests of the tree for the intercrop. However, in most cases, the general principle suggested above should be followed; namely, cultivation should begin early in the season to insure vigorous early growth, and growth should be checked by some means, either by the intercrop itself or by means of a cover crop later in the season. For this reason the intercrop should be one that requires cultivation, but does not make it necessary to work the soil near the tree late in the season. It is evident that there will be soils and conditions where this principle may be ignored.

TILLAGE OF YOUNG ORCHARDS JUST COMING INTO BEARING

It is generally true that a few fruits may be expected from a weak tree younger than from a vigorous tree; however, it is nearly always true that a profitable crop will be secured more quickly from the tree that has been encouraged to make a vigorous growth from the beginning. The fruit is likely to be borne on the spurs that form earliest in the season. There is a great tendency for the bloom to fall without setting fruit or for the young fruits to

fall from the trees just coming into bearing. It seems to be true that the older spurs will hold their fruit the following spring better than the ones that formed late in the season. It is also true that these trees just coming into bearing are still likely to grow late enough so that there is danger of early winter injury. For these reasons, then, it seems particularly wise that the system outlined above, of early plowing and of early sowing of the cover crop, should be followed. In fact, during the first few years



FIG. 205.—A YOUNG APPLE ORCHARD BELONGING TO THE DEPARTMENT OF POMOLOGY, NEW YORK STATE COLLEGE OF AGRICULTURE, ITHACA, N. Y., WITH DWARF ESSEX RAPE SOWN JULY 19 AS A COVER CROP

In this heavy soil the rape has probably made more growth than could have been expected from any other crop.

after an intercrop ceases to be grown in the orchard, it would seem wise to sow a cover crop early in July in any but the lighter soils. By this means, not only will the humus supply of the soil be kept up to the best advantage, but the trees will go into winter in the hardiest condition and will likely be brought into conditions of growth more favorable to early fruiting.

TILLAGE OF BEARING ORCHARD

In case of the bearing orchard, the importance of early plowing in the spring is as great as with trees at other ages. It is possible

that the importance of sowing the cover crop early is not so great, for the tree is almost sure to ripen its wood sufficiently before winter. The only advantage, then, of the early sowing of the cover crop would be that a larger supply of humus can be kept in the soil, since it is possible to get a larger amount of growth in the cover crop. It is also possible to use such crops as clover for a cover crop when they are sown early. I may say that some



FIG. 206.—COVER CROP OF RED CLOVER IN A THIRTY-THREE-YEAR-OLD ORCHARD BELONGING TO MR. F. W. CORNWALL, PULTNEYVILLE, N. Y.

With these trees Mr. Cornwall gets very satisfactory annual crops. The practice of early plowing and early sowing of the cover crop is following here as with the young orchard. Mr. Cornwall thinks this is one of the important reasons for the excellent results he has secured with this orchard since he took charge of it.

experience, even in the lighter soils, indicates that when the cover crop is sown as early as July 1, the trees remain in a thrifty condition throughout the season. Whether the fruit would be larger if cultivation were continued later, I am not in a position to say, but I know of orchards tilled in this way where the fruit averages larger than in most orchards in the same section.

TILLAGE IN RENOVATING AN OLD ORCHARD

The importance of early plowing in the spring is particularly great in the case of an old orchard that has not been plowed during previous years. If the trees have been making a very weak growth, and are plowed late in the spring, there is danger of their starting a late succulent growth that will result in injury around the base of the tree. Then, if the soil is plowed very early, marked invigorating effects may be observed the first year the orchard is plowed, while this may not be true if the plowing is not done early. In fact, if the soil is not so light that there is danger of root freezing, it is perhaps wisest to plow in the fall the orchard that has been in sod. In that case the maximum benefit from tillage during the first year may be secured. In a very light gravelly or sandy soil, if by any chance the conditions should be such that the roots are not deep, it is sometimes unwise to have the ground plowed in the fall. The fall-plowed soil will freeze deeper and there may be danger of root killing.

CONCLUSION

The above suggestions are not intended to be rules that may be followed in all cases—in fact, it is impossible to make such suggestions for fruit growing. There may be many cases when a very different procedure will be wiser, but it is certainly true that generally the tree will go into winter in a more hardy condition, and the nature of its growth will be that best adapted to steady fruiting, if its growth is vigorous during the early season and is checked during the latter part of the season. Generally, in sections as far north as this, such conditions of growth can be brought about more satisfactorily when a cover crop is plowed under very early in the spring and another cover crop is sown between July 1 and August 10. Some growers sow their cover crops as early as June 20. If there are no orchards in the section where very early plowing is practiced, perhaps it would be wise to take August 1 as a standard time for sowing and to experiment with earlier sowing.

COVER CROPS

R. D. ANTHONY

Associate Horticulturist, New York Agricultural Experiment Station,
Geneva, N. Y.



Cover crops in the fruit plantation are those which are sown after the spring cultivation with the intention of plowing them under in the fall or spring. In most orchards the use of cover crops should be regarded as a necessary complement to the cultivation—a fact far too often overlooked.

PRINCIPLES OF USE

The prime use of cover crops is to increase the amount of food for the fruit crops. The clay loam soils of our fruit regions contain large amounts of the necessary plant food elements, but usually these are in an insoluble form and hence unavailable to plants, which must feed on the nutrients dissolved in the soil water that is constantly being absorbed by the roots and passed on to the leaves—the stomach of the plant. Our problem is so to treat these elements that they become soluble and therefore available as plant food. If we drop a small piece of limestone into a weak acid it soon disappears, partly by the formation of gas and partly by dissolving in the acid. The soil water is normally slightly acid and can dissolve limestone in the same way, thus making the water “hard.” The insoluble plant food elements can be broken down similarly by an acid soil water and thus become available.

The acidity of the soil water is largely due to the acids which are formed when organic matter decays. Therefore, the first essential in soil fertility is to insure the presence in the soil of a liberal supply of humus—the name used for decaying organic matter. For the fruit grower there is no better way of securing humus than by the plowing under of vigorous cover crops.

The presence of humus in the soil has a very important bearing upon its physical condition. When the supply of organic matter becomes low, our clay soils are stiff and difficult to work, and they puddle and bake easily. Those rich in humus have better drainage, can be plowed earlier, remain in plowed condition longer, and in every way are easier to handle.

Plants utilize only the moisture which surrounds the soil particles. When the roots reach the level of the ground water, where the air has been driven out, their activities cease. Unless the soil be of such a nature as to be retentive of this moisture, plants may suffer from drought, even in seasons of normal rainfall. Humus is like a sponge in its power to retain moisture, and its presence in the soil greatly increases the amount of water available to the plant.

Only in one way do cover crops add to the total amount of any one plant food element in the soil, and that is through the nitrogen-fixing activities of the bacteria which are usually found on the roots of the legumes. When non-leguminous cover crops are used, the available food supply may be increased, but not the total amount of the food elements.

The conservation of plant food is another valuable function of cover crops. Every spring our rivers and creeks carry down to the lowlands and the lake bottoms immense deposits of silt which the rains have washed from the fields. These minute particles of soil are the ones which are most readily acted upon by the acid soil water, and hence their loss from our fields is a serious loss of plant food. Nothing checks this soil washing in the orchards so effectively as the mat of rootlets supplied by a good cover crop. The breaking down of soil particles, with the resulting formation of soluble plant food, goes on in the fall and spring when the fruit crops are in a dormant condition. By using cover crops which remain alive through the winter, much of this plant food is utilized by them and thus prevented from washing away in the drainage water. This plant food then becomes available to the fruit crops when the corn crop decays.

The intense cultivation given to orchards is a forcing process which, if continued throughout the season, would result in a late

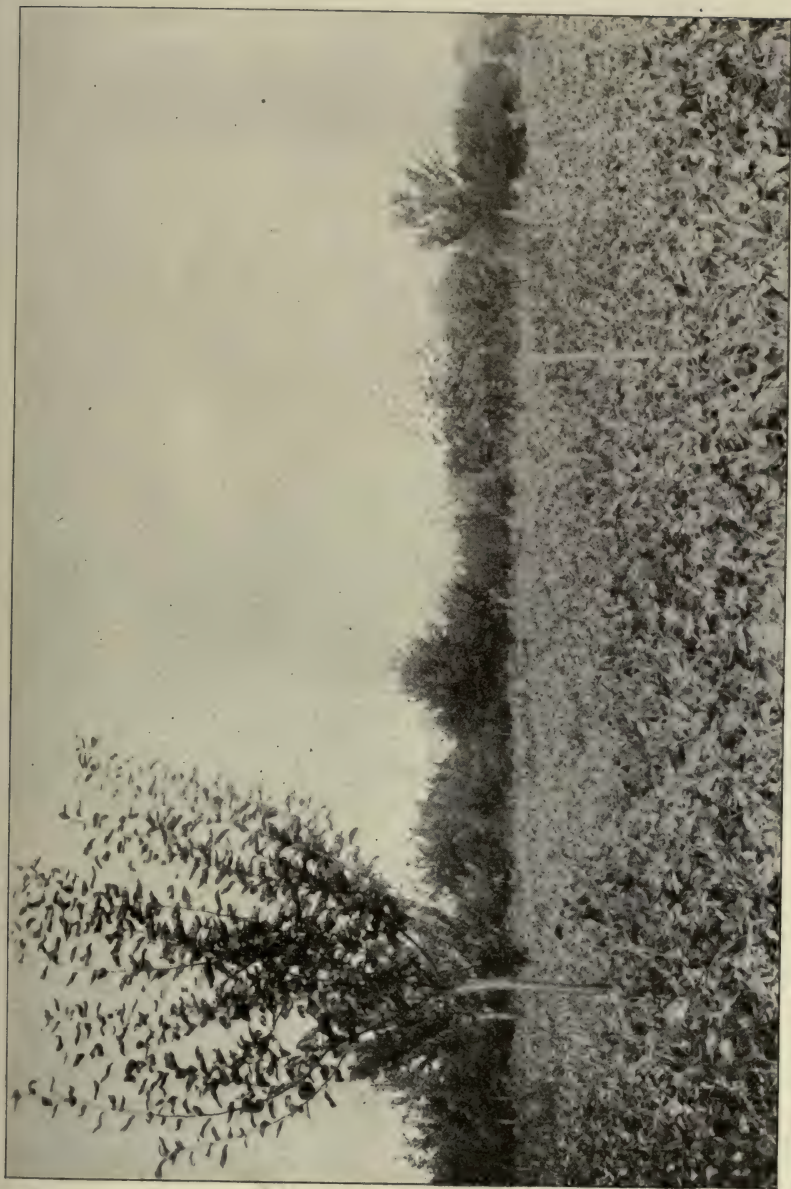


FIG. 207.—CANADA PEAS AND BUCKWHEAT

growth of wood that would not have time to mature and consequently would be very liable to be injured during the winter. Seeding down a cover crop in the summer decreases the food and moisture available to the trees and thus checks this growth and matures the wood. With late-maturing varieties of apples which sometime fail to attain the desired high color, this hastening of the maturity is very important. In this connection the character of the season has considerable to do with the time of sowing the cover crop. When the rainfall is light and the growth limited, the time of seeding can be delayed until late in July or even the middle of August, depending upon the crop and the location. When the rainfall is above normal and trees are making a vigorous growth, the cover crop should go in during the latter part of June or early in July.



FIG. 208.—MAMMOTH CLOVER IN OCTOBER

Land unprotected by a crop during the winter freezes deeper and is more liable to heave than if protected. For this reason tree and vine roots are more liable to be injured where cover crops are not used. To secure this winter protection and as much growth as possible, it is best to plow under the crop in the spring rather than in the fall, but care must be taken that this is done before it has made sufficient growth to rob the fruit crop of plant food or moisture.

Trees standing in a heavy cover crop over winter are more liable to be injured by mice. For this reason it is well to keep the cover crop at least two feet from the trunks.

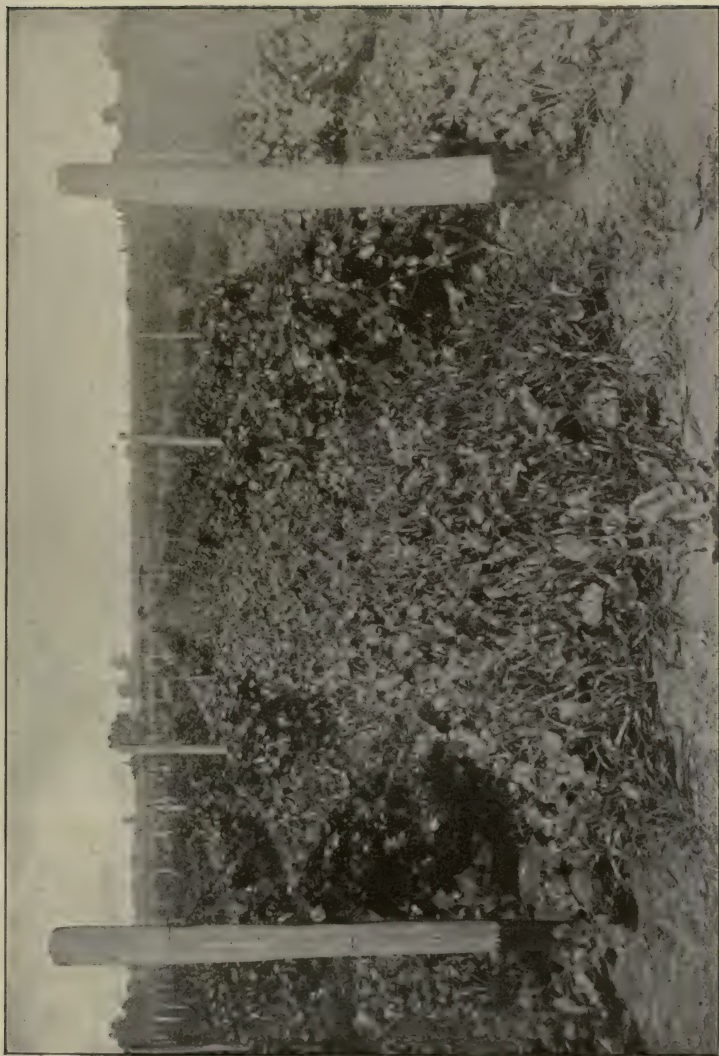


FIG. 209.—WHEAT AND COWHORN TURNIPS IN A YOUNG VINEYARD

There are two general types of cover crops: the legumes, or nitrogen-gathering plants, and the non-leguminous sorts. The following belong to the first type.

LEGUMINOUS COVER CROPS

The Clovers

Red clover, either medium or mammoth, is the popular leguminous cover crop in this state. On poor soils — especially those which are acid — and during dry seasons, the catch is poor and



FIG. 210.— RYE AND WINTER VETCH

the growth small, but where conditions are right it gives an excellent cover. Because of the uncertainty of its growth it is generally used in combination with other cover crops. Crimson clover is an annual which is not quite hardy enough for most of the state outside of the southern Hudson Valley.

The Vetches

There are two kinds, the spring and the winter vetch. It is the latter which is used as a cover crop. Within recent years

this has become very popular. It will grow on land where clover fails, in a season too dry for clover. It grows at low temperatures and covers the ground with a dense mat. If left too long in the orchard in the spring, it will cause a serious loss of moisture.

Peas and Beans

Cow peas and soy beans are used extensively in the south, but are not hardy and not so satisfactory as other legumes in this state. Canada field peas have been used to some extent and make a satisfactory combination with other cover crops, but they cannot compete with the more popular clovers and vetch.

NON-LEGUMINOUS COVER CROPS

The non-leguminous cover crops will, in general, make a more satisfactory growth on poor soil than the legumes; hence they are much used as a means of building up the poorer soils preliminary to sowing the nitrogen gatherers. The following are commonly grown in this state.

The Grains

Oats, barley, rye, wheat, and buckwheat are all used in varying degrees. Oats make a satisfactory early growth but are killed by the first freeze, so they find their best places in combination with other crops. Barley is also killed by the cold, but it usually makes a good growth before cold weather. Rye is the most satisfactory grain to use. It grows at a low temperature and will make a good growth on soil too poor for clover. It should be plowed early in the spring. Wheat is not so good as rye, although it is less injurious if spring plowing is long delayed. Buckwheat will grow on poorer soil and under more adverse conditions than any of the above, but it affords very little cover for the winter. It should be an important part of all mixtures where the land is at all poor.

The Crucifers

Rape and turnips do not give sufficient cover when used alone, but make a valuable addition to mixtures of other cover crops.

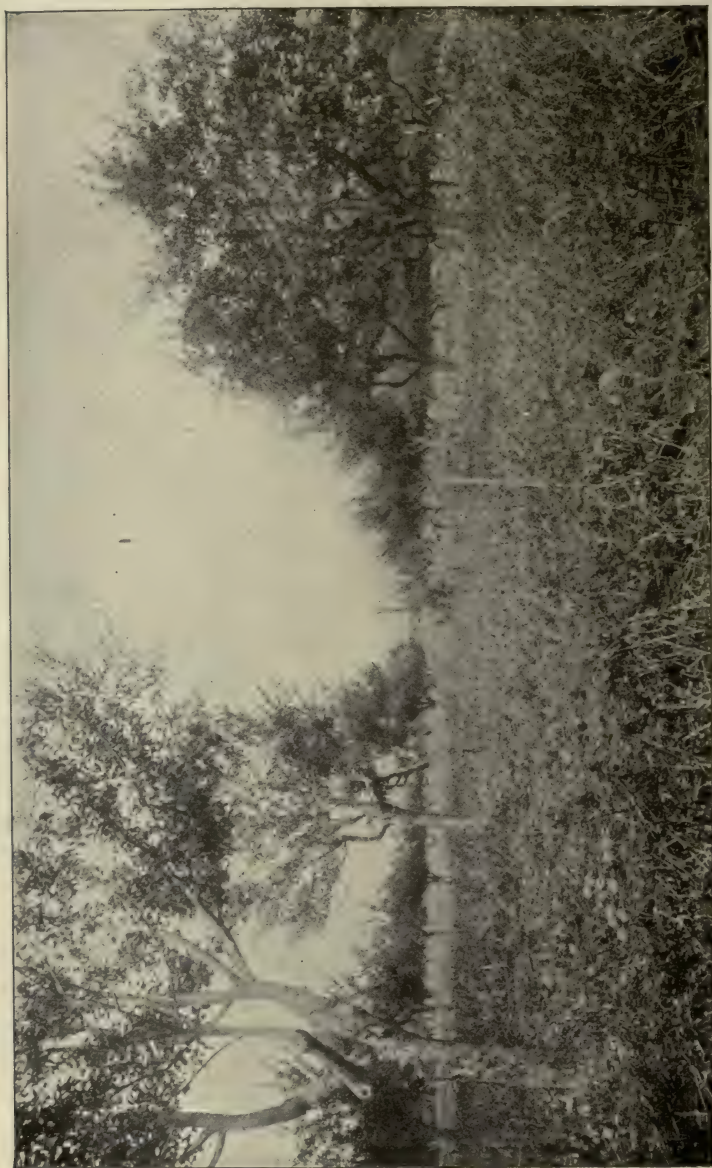


FIG. 211.—COW PEAS KILLED BY AN OCTOBER FROST

COMBINATIONS OF COVER CROPS

No one crop meets all the requirements of an ideal cover crop; for this reason it is always best to use a combination. The nature of the combination will depend on the soil and the season. It should be so planned as to give quick growth, a maximum amount of organic matter, winter protection, and preferably should contain some legume, except in orchards already making too vigorous growth. In the table below are given a few good mixtures.

QUANTITY OF SEED PER ACRE

Legumes

Red clover, 15-20 pounds
 Crimson clover, 15-20 pounds
 Hairy vetch, $\frac{1}{2}$ -1 bushel
 Cow peas, $1\frac{1}{2}$ -2 bushels
 Soy beans, 1- $1\frac{1}{2}$ bushels
 Canada field peas, 2-3 bushels

Non-nitrogenous cover crops

Oats, 2-3 bushels
 Barley, 2- $2\frac{1}{2}$ bushels
 Rye, $1\frac{1}{2}$ -2 bushels
 Wheat, 2- $2\frac{1}{2}$ bushels
 Buckwheat, 1- $1\frac{1}{2}$ bushels
 Rape, 2-5 pounds
 Turnip, 4 pounds

QUANTITY OF SEED PER ACRE IN MIXTURE

Red clover, 10 pounds
 Hairy vetch, 15 pounds
 Oats, $\frac{1}{2}$ -1 bushel
 Cowhorn turnips, $\frac{1}{2}$ pound

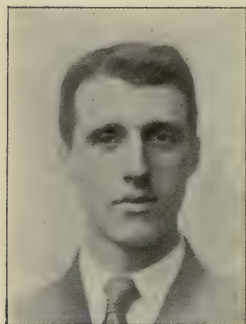
Buckwheat, $\frac{1}{2}$ bushel
 Oats, 1 bushel
 Rye, 1 bushel

Buckwheat, $\frac{3}{4}$ bushel
 Barley or oats, 1- $1\frac{1}{2}$ bushels
 Red clover, 15-20 pounds
 Barley or oats, $1\frac{1}{2}$ bushels

INTERCROPPING THE YOUNG ORCHARD — FROM AN ECONOMIC STANDPOINT

M. C. BURRITT, ITHACA, N. Y.

Director New York State Farm Bureaus



I think most fruit growers will agree with me that the principal reason they are in the business of fruit growing is to get a living that way. I presume many are in the business of fruit growing just because they like it—because it is an enjoyable business; but certainly a prime motive is the profits they may gain from this enterprise.

I presume many older men who have been in this business for a long time, and who may have accumulated a considerable amount of profit from it, are not so much interested as some of the younger men — men who have apple orchards, inherited from their fathers at a time when the business was profitable. It is not known just how much those orchards cost. Some of us are beginning to find out how much, and we are concluding that it is no small amount of money. Those who have large orchards already, and can simply take the profits out of these older orchards and grow younger orchards with them, do not mind the cost so much; but the younger men just starting out find themselves up against a very serious problem — paying expenses as they go along.

There is complaint nowadays that we do not have anything to say about fixing the price of the things we sell, and that is more or less true; but we shall not put ourselves in a position to have anything to say if we allow misleading statements as to profits to go out. The average New York City man's idea of farming, and of fruit growing particularly, is that it is a short and sure road to wealth. We are primarily to blame for this. What leads him to believe that the fruit grower's profits are so large? Usually it is the big stories of profits that have been printed. Professor

Hedrick has said that the average yield in the Auchter orchard was 116 barrels per acre; that is much above the average yield of this county. The average yield, as shown by orchard surveys, is 70 to 75 barrels per acre. That would make quite a big difference in figuring the average cost of production. We are fixing our ideas from figures on some of our orchards that are not quite representative of the average.

The average cost of producing our barreled apples we do not know. We ought to know. If we are business men it is up to us to find out, and that means some concerted action. It will be much harder for us to find out what it costs to grow farm products than it is for the merchant to find out the cost of his goods, but that is no reason why we should not do it. We are falling down on the business end. It is up to us, it seems to me, to take some steps to obtain accurate records on a large number of farms that will establish something near an average cost. And when people in the city are educated as to just what it costs to grow products, these stories of big profits which are going around will be discounted.

The very fact that the subject of the cost of milk production is being studied is having a very wholesome effect on the market at the present time, and that will tend toward a higher price for milk. We can do the same thing with apples and hay and grain.

WHAT ENTERS INTO COST OF PRODUCTION

There are three general things that enter into the cost of production. The first is labor—man and horse; second, the raw materials that go into the cost of that production, such as fertilizers and manures, cover crops, etc.; third, the fixed charges, such as interest on the investment, taxes, etc. I know that people say, "Well, if I figured business that way I would not make a cent." Does figuring really make any difference with the facts? They are there just the same. One can say he is making \$200 an acre from apples if he chooses, but he is not gaining anything by it; he is rather losing. Corporations are always exaggerating their costs; they are always trying to prove that the things are costing more than they do. The cost of our product, in too many minds, is the labor hire and the fertilizers or seed bought. That

is no cost at all. One may say that he will not count the cost of his buildings, or telephone, or other things, but all these items enter in; they are there just the same.

Let us compare the cost of different crops — Table I. Notice how the labor runs up. I can grow an acre of hay for 13½ man-hours; an acre of wheat, 26 man-hours; beans, 43; apples, 175. Horse labor runs up the same way, but not in the same proportion.

TABLE I
COSTS OF PRODUCING FARM PRODUCTS

FACTORS	PER ACRE			
	Hay	Wheat	Beans	Apples
<i>Labor</i>				
Man hours (20c.)	13½	26	43	175
Horse hours (15c.)	14½	43½	55½	66
Cost for labor	\$4 90	\$11 72	\$16 88	\$45 00
<i>Materials</i>				
Fertilizer		\$3 88	\$5 14	
Manure				\$2 86
Cover crop				1 57
Barrels (78)				28 13
Spraying material				3 69
Seed	\$1 74	1 92	3 10	
Threshing		1 30	82	
Total	\$1 74	\$7 10	\$9 06	\$36 25
<i>Other and fixed charges</i>				
Interest	\$5 00	\$5 00	\$5 00	\$15 00
Taxes	40	40	40	1 19
Equipment	72	1 71	1 96	6 38
Overhead	52	99	1 86	5 83
Total	\$6 64	\$8 10	\$9 22	\$28 40
Grand total	\$13 28	\$26 92	\$35 16	\$109 65

Of course these prices will vary on different farms. Some men can handle their business so well that they get man labor for from 15 cents to 18 cents an hour. Horse labor varies from 15 cents to 25 cents; the average is a little over 15 cents an hour. Every time I take a team out of the barn it probably costs about 30 cents an hour for that team, without a driver. We do not always think of this.

Note the total cash cost here — \$7.10 on wheat, \$9.06 on beans, \$36 on apples; notice too that the fixed costs that we so many times ignore are a very important part of it. I do not give my figures to set up an average; these must be determined on every farm. I have merely pointed out some of the costs that enter into production.

VALUE OF INTERCROPS

A very important part of the business of growing an orchard of a bearing age is getting the money to do it with. It is all very well, if one has an old orchard paying dividends, to put it in



FIG. 212.—BEANS IN THE YOUNG ORCHARD

this young orchard — that is his privilege. But some of us cannot do it; we have to pay our way as we go along. I look at the intercrop this way: all the profits I can get out of the crop between the trees are so much gain. I have that much less invested in the orchard. If I have to spend ten dollars an acre per year, and if I can get five dollars out of the crop, I am just so much ahead. Certainly, it is an advantage to lessen the wait for returns. Much is said about getting profits from orchards in five or six years, but the average man does not do it. We are more apt to set our standards by some individual who has been especially successful. Somebody has an orchard that has made a big profit at the end of five or six years. That is noted in a local paper, which goes to the cities, and it is taken by the public as an average. It is misleading. On an average, an apple orchard does not

pay a profit under ten years, and in many cases it is fifteen years instead of ten.

Furthermore, the growing of crops between trees increases the turn over of labor and materials on a farm. Professor Warren has quite conclusively shown, from the records on something like 3,500 farms in this state, that the large business is the most profitable. You can sometimes enlarge a farm by growing two crops on the same land, just the same as by buying more land. If you can grow a crop of cabbage, beans or what not in your young orchard, you have increased the size of your business. Every farm must have so much labor — you hire one man or two men for a year. Some of the time that labor is well used, and some of the time you have to hunt around a little to find something for the men to do. That man, as a rule, gets the largest net returns, who occupies the time of his men most effectively — who keeps them working on products to be sold.

Then take the matter of horses. It costs \$120 a year, on an average, to keep a horse, and our figures show it is nearer \$140. Whether you work that horse part of the time or all of the time, you have to pay for his keep just the same. The average farm horse does not work much more than one-third of his time. If you can find something for the horse to do that brings in money, you have made some gain. At the same time you are using your man and your machinery more effectively. The more service you can get out of your land, machinery, and labor — man and horse — the better off you are.

The disadvantages of intercropping are their inconvenience. They increase, slightly, the expense of cultivation. In the case of some crops we have the inconvenience of spraying and of harvesting. We all know these inconveniences and we may as well admit them. But, if it pays in financial returns to put up with them, we had better do it.

ACTUAL RETURNS AND EXPENSES

I shall give some figures on a twelve-year-old apple orchard set thirty-six feet each way, filled one way with plums and pears, so there is a space thirty-six feet wide running one way. On this $7\frac{1}{2}$ -acre orchard, containing something over two hundred trees, we have spent, in the last twelve years, \$1,579.50, or \$208.93

an acre, including interest on valuation. We now value it at about \$225 an acre. We have secured a gross income from that piece of land of a little over \$1,438.55, or \$190.28 an acre, but it still owes us \$140.95, or \$18.66 an acre. In other words, after paying for all the labor and five per cent interest on the capital invested in the land, we still lack nearly \$141 of breaking even at twelve years. The total income was obtained from the orchard itself, from plum and pear fillers, and from intercrops.

TABLE II

COSTS, INCOME, AND PROFIT AND LOSS OF A 7½-ACRE, 12-YEAR-OLD APPLE ORCHARD
FILLED ONE WAY WITH PLUMS AND PEARS

YEAR	Cost of orchard	Income from orchard	Loss on orchard	Income from crop	Net profit or loss
1903.....	\$116 39	.....	\$116 39	\$15 17	—\$101 22
1904.....	161 57	.....	161 57	42 57	—119 00
1905.....	96 63	.....	96 63	43 13	—53 50
1906.....	93 18	.....	93 18	120 90	+27 72
1907.....	96 73	.....	96 73	38 85	—57 88
1908.....	67 85	.....	67 85	37 68	—30 17
1909.....	87 61	\$41 90	35 71	O { 61 32 s { 39 29 }	+64 90
1910.....	101 12	38 65	62 47	60 70	—1 77
1911.....	93 23	38 00	55 23	30 45	—24 78
1912.....	159 80	30 56	129 24	52 43	—76 81
1913.....	235 26	229 28	5 98	194 88	+188 90
1914.....	270 13	252 63	17 50	170 16	+152 66
12 years.....	\$1,579 50	\$631 02	\$948 48	\$807 53	—\$140 95
7.5 acres.....	208 93	83 47	125 46	106 80	—18 66

Labor rates used in figuring crop profits vary according to season.

The \$208.93 total cost was made up of \$43.12 man labor, \$27.20 horse labor, and \$138.61 for materials and interest. The income from that orchard was \$807.53 from crops, or \$106.80 an acre for the twelve years; that is, a little less than \$10 an acre per year for crops. We charge the interest and taxes and overhead charges all against the orchard; it is net so far as the piece of land is concerned. From the plums and pears we obtained \$415.44, and from the apples \$215.58, or about \$28.50 an acre.

Had we not intercropped that orchard, it would have owed us more than it does now. Had we grown simply an apple orchard

without any fillers, and without any crops, that orchard would have cost us an actual outlay of about \$250 an acre, instead of \$200. For me that is sufficient argument for growing crops between the rows. In giving these figures I am not setting up any standard, because I know some growers have made two or three times as much as this from intercrops, and others have not made anything. I am thoroughly convinced, so far as I am concerned, that it pays to fill young apple orchards, and that it pays to grow crops between the rows. The crops we grew were as follows: corn, beans, beans, beans, beans, and corn again. Then we put in oats, wheat, and two years of hay, and then went back to wheat and beans again. Of course we have to grow the intercrops farther and farther from the tree rows each year. We now keep a full harrow width on each side of the tree for cultivation, having gradually widened the distance each year.

As to the income from these various crops, I do not feel that I can give averages, except in one or two cases. So far as we have tested, beans have averaged \$8.40 per acre net profit for five years, charging interest and overhead expense to the orchard; corn, an average of \$3.50 for the two years that we grew it; hay, \$5.50; grain, \$8.15 for the two years. Peas gave us a profit of \$25 an acre, but that was two years ago when we had a good crop. Last year we did not try to grow peas.

We all know the relative advantages and disadvantages of growing these various crops. We know, for instance, that corn between the tree rows is not advantageous to the trees in many cases. We know the trouble in harvesting — I will not go into this. I have given these figures simply to show some of the possibilities of these crops.

APPLES WITH PEACHES AS FILLERS

I shall also give the facts on one other orchard. This is an apple orchard filled both ways with peaches. It is a ten-acre orchard, but I shall give the figures only on that half which is now seven years old, and for the first four years. It cost us \$84 an acre to grow this orchard. During this period we obtained a gross income of \$313.13, or a little over \$62 an acre, leaving a net loss of \$107, or a little over \$21 an acre, at the end of the four-year

period. The man labor was 15 per cent of the cost, the horse labor 20 per cent, and material and overhead charges about 65 per cent. *

In this orchard we grew four crops of beans, successively. It was filled both ways with peaches, so there was not much space.

TABLE III

COST OF GROWING 5 ACRES OF APPLES AND PEACHES TO FOUR YEARS OF AGE

YEAR	MAN LABOR		HORSE LABOR		Total labor	Material and fixed costs	Total
	Hours	Cost (18c.)	Hours	Cost (15c.)			
1908.....	124	\$22 32	36	\$5 40	\$27 72	\$106 03	\$133 75
1909.....	63½	11 43	74½	11 18	22 61	65 14	87 75
1910.....	58	10 44	24½	3 67	14 11	71 05	85 16
1911.....	162	29 16	63	9 45	38 61	75 00	113 61
Total....	.....	\$73 35	.....	\$29 70	\$103 05	\$317 22	\$420 27
Acre (5).....	.....	\$14 67	.....	\$5 94	\$20 61	\$63 40	\$84 01

SUMMARY OF THE COST OF A 4-YEAR-OLD 5-ACRE APPLE AND PEACH ORCHARD

YEAR	Crop grown	Net income from crop	Income from orchard	Cost of orchard	Profit	Loss
1908.....	Beans....	\$63 37	.....	\$130 12	.....	\$62 75
1909.....	Beans....	66 70	.....	85 03	.....	18 33
1910.....	Beans....	79 81	.....	83 39	.....	3 58
1911.....	Beans....	53 20	\$46 05	61 95	\$37 30	.....
		\$267 08	\$46 05	\$360 49	\$37 30	\$84 66

Total cost per acre, exclusive of income.....	\$72 10
Total cost per acre, including income.....	9 47
Total net cost per 100 trees.....	4 73
Total net cost per apple tree.....	376
Total net cost per apple tree, excluding income.....	2 86
Average net income per year (excluding interest and taxes), beans.....	66 77
Average net income per year (excluding interest and taxes) per acre.....	13 35

We grew six rows of beans the first year and four the second, third, and fourth years. The last crop was very small. From these four crops of beans we obtained a net profit of \$267 (again not charging the interest and overhead against the crop, but against the

orchard), or \$53 an acre. From the fillers we obtain a profit which was a little less than \$10 an acre the fourth year.

In this orchard, instead of having an investment of \$72.10 an acre at the end of four years, we have an investment of only \$9.47, due chiefly to the fact that we have grown crops between the rows. I may say that in the last two years this orchard has borne peaches enough to more than defray its entire cost. And this peach orchard, seven years old at the present time, filled with peaches still in their prime, has not only paid the entire cost of growing all the trees, but has returned a profit of something like \$16 an acre in one year.

Perhaps these two cases represent a variation that all of us will find more or less. In one case we have an orchard that is still in debt and in which we have not broken even at the end of twelve years, whereas another orchard has made some profit at six years. You will find all these variations.

CONCLUSIONS

If we are in this business for the profit there is in it and if we do not care to make a heavy investment in the growing of young orchards, and wait ten to fifteen years for returns from them, I am fully convinced that intercropping and interfilling is a profitable practice, from an economic point of view.

SOD MULCH vs. TILLAGE FOR APPLE ORCHARDS

W. D. AUCHTER, BARNARD, MONROE Co., N. Y.

INTRODUCTION



Orchardists have heard and read a great deal in the past ten to twenty years about the best manner of handling the soil in their apple orchards. Many different methods have been advocated. Thus, we have heard sod, sod mulch, sod and pasture, clean tillage, tillage and cover crop, alternate tillage, and partial tillage all praised and condemned alike. As a result, many fruit growers have been just a little doubtful as to which method really

was the best. From my standpoint, I cannot see any reason for an argument in a case where all sides may be right. For instance, one man may have an orchard on such a steep and rocky hillside that it would be folly for him to try to cultivate the soil; another man may have an orchard on a hillside a little too steep to allow of complete cultivation, but he could practice partial cultivation—that of plowing and working about the trees with a strip of sod in the center of the rows to hold the soil from washing; while still another man with a level-lying orchard will usually find that tillage and cover crops is the best method of culture to use.

SOD MULCH vs. TILLAGE AND COVER CROPS

As most of the orchards in New York State are easily adapted to either the sod mulch system or tillage and cover crops, and since these are the two principal systems about which so much is heard, I will give my experience with these methods only.

The main object in orchard culture is the preservation of moisture. Water constitutes from 82 to 89 per cent of the apple. Likewise, the twigs and leaves have considerable moisture in them. As a result, if the soil moisture is lost, the effect of it is generally seen in the small size of the apples. This is commonly

noticed in very dry seasons, when the apples are small as compared to their size during seasons of abundant rainfall.

The sod mulch system, more commonly known as the Hitchings method, consists of getting a good, heavy sod in the orchard, from a mixture of blue grass, timothy, orchard grass, and tall meadow oat grass, and then leaving the orchard permanently to this sod. The grass should be cut, preferably twice a year, and allowed to lie where it falls in bearing orchards. The contention is that this grass will act as a mulch and thus conserve the soil



FIG. 213.-- VIEW OF ORCHARD WHERE TEST WAS CARRIED ON

Plat at left was given over to clean cultivation and cover crop method. At the right is the sod mulch plat with grass at cutting time

moisture from being lost. There is no doubt but that this is an easy, cheap, and convenient method to use, provided good results are obtained with it.

When a system of tillage and cover crops is used in an orchard, the soil is plowed every spring and harrowed from five to seven times, and, if possible, after every rain. About the first of August a cover crop of some legume is sown. The next spring this cover crop is plowed under and the same system carried out again.

By this method organic matter and nitrogen is added to the soil and, as a result of the deep dust mulch which is kept on the orchard, the moisture is preserved.

CULTURAL EXPERIMENTS

In 1903, the New York Agricultural Experiment Station at Geneva, being interested in this debated subject, selected one of my bearing Baldwin apple orchards in which to make a test of these two methods of culture.

The trees in this orchard were 27 years old at the beginning of the experiment. They were 40 feet apart on the square system, or 27 trees to the acre. The orchard was ten rows wide and twenty-seven long, thus making it nearly three times as long as broad, and consisting of $9\frac{1}{2}$ acres. The soil is a fertile Dunkirk loam about 10 inches deep, with a sandy to gravelly subsoil. The topography of the orchard is very slightly rolling.

The orchard was divided the long way into equal parts. In one-half the sod mulch method was started, while in the other the tillage and cover crop system was used, as explained above.

EFFECTS OF THE TWO METHODS

The test had not been running two years, before my neighbors began asking me if I was trying to kill half of my orchard. The difference between the two halves was striking. As far as one could see the orchard, he could tell exactly which rows were cultivated and which were in sod. The cultivated trees had a rich, dark green foliage and a rank, vigorous growth, while the trees in sod had a sickly yellow-green foliage and a short growth of wood. When it came time to pick the crop, the difference was again as striking. It did not take the pickers, who were picking by the barrel, very long to find out that there was more fruit on the tilled trees, thus allowing them to get a barrel with fewer moves of the ladders. They noticed also that the barrels filled up more quickly with the larger fruit on the tilled plat. When uninterested help like this noticed the striking difference in the two plats, I felt sure that it was an unbiased opinion.

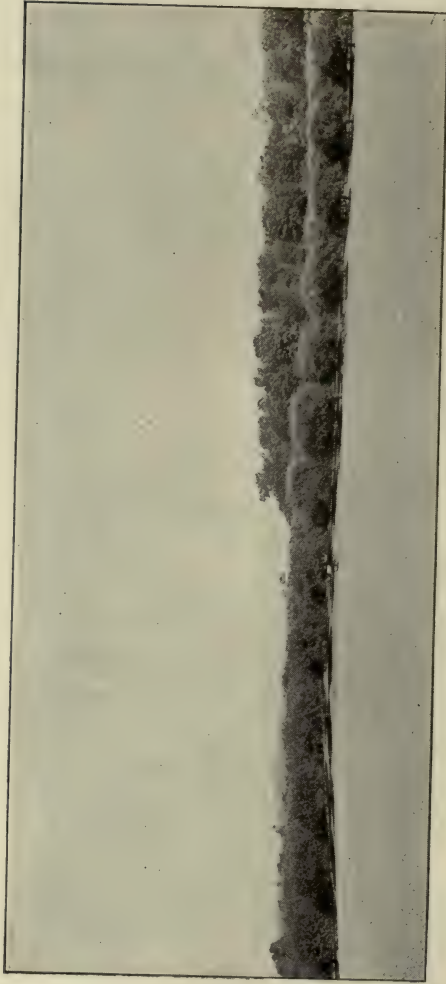


FIG. 214.— NOTE SIZE OF TREES IN TILLAGE PLAT AS COMPARED WITH THOSE IN SOD MULCH PLAT

CHANGE OF EXPERIMENT

The experiment as above described was continued for five years, when it was proven without doubt to the fruit growers in my section that tillage and cover crops was the only method of orchard culture to use in western New York, at least. The Geneva Experiment Station published Bulletin No. 314 at this time, giving the five years' results of the two tests.

The orchard was then cut across the narrow way, making four equal plats. One plat was left in sod for five years more, making ten years in all; the other sod plat was plowed up and given tillage and cover crop; one tilled plat was carried on for five years more, while the other tilled plat was seeded down to sod. We were interested to see if the tillage would bring up the sod quarter and also to see what effect the sod would have on the tilled quarter.

RESULTS OBTAINED

The results could be seen sooner than we had expected. During the first summer that the sod plat was plowed up and tilled, the foliage at once became as dark a green and as healthy as that on the plat that had always been plowed. The trees began to grow and take on a brighter appearance, and at the end of the year it hardly seemed possible that such a beneficial result could have been obtained from one year's plowing and harrowing. The crop likewise became larger on these plats, as shown in Table I.

When we came to study the other quarter of the orchard — that which had been tilled five years and then seeded down to sod — the results were just as marked. The trees began to show the detrimental effects of sod the first season. The foliage was poorer, the tree growth shorter and the yields were reduced. At the close of five years this plat looked as bad as that which had been in sod for ten years. It looked to us as if the grass robbed the trees of more moisture than it conserved.

TABLE I

AVERAGE YEARLY YIELDS PER TREE FOR THE LAST FIVE YEARS UNDER DIFFERENT CULTURAL METHODS

Cultural Methods	Barrels
Tilled for ten years.....	5.03
Sod for ten years.....	2.32
Tilled five years, then sod five years.....	2.00
Sod five years, then tilled five years.....	5.17

Table I speaks for itself. It can be seen that tillage has in all cases increased the yield considerably, while the sod treatment has lowered it.

GENERAL EFFECT OF SOD MULCH FOR TEN YEARS COMPARED TO
TILLAGE AND COVER CROPS

In comparing the quarter of the orchard that had been in sod for ten years with the quarter under tillage and cover crops for the same length of time, probably the greatest difference could be



FIG. 215.—ROW OF TOMPKINS COUNTY KINGS GROWING UNDER THE MULCH SYSTEM ON FARM OF L. L. MORRELL, KINDERHOOK, N. Y.

seen. At the end of the ten years, the tilled trees looked more vigorous and healthy than ever before, but the trees in sod certainly presented a sickly appearance. The foliage was sparse, the leaves small and yellow. The trees were making practically no terminal growth. Their appearance was that of a starved orchard. Measurements showed that during the ten years the trunks of the tilled trees had increased 1.51 inches more in transverse diameter than had those in the sod plat. This means much

in a thirty-year-old apple tree. The weight of the leaves on the tilled plat averaged 2.8 grams more per leaf than those on the sod plat. The fruit ripened about three weeks earlier on the sod plat and generally excelled in color the fruit from the tilled plat. However, the fruit from the tilled plat was larger, crisper and juicier than that from the sod plat, and kept from three to four weeks longer in common storage. Actual count showed 434 apples per barrel on the sod plat, weighing 5.01 ounces each, while it took only 309 apples from the tilled plat to make a barrel. These apples weighed 7.04 ounces each.

COSTS AND RETURNS

In the final analysis, the thing in which fruit growers are all interested is yields, costs, and returns. No matter how good a method may be, if it will not produce the income, we are not interested in it. I venture to say that in this respect we are no different from other business men.

Summarizing the yields, costs, etc., this orchard for ten years,* gave us an average yield per acre on the sod plat of 69.16 barrels, and on the tilled plat 116.8 barrels, or a difference in favor of the tilled plat of 47.64 barrels per acre per year. The average cost per acre of growing and harvesting apples in sod was \$51.73; under tillage the cost was \$83.48 — a difference in favor of sod of \$31.75. However, when these figures were subtracted from the gross returns, it was found that the increased returns from the larger crop on the tilled plat more than offset this difference. There was a balance left for the sod plat of \$74.31 per acre and for the tilled plat \$140.67 per acre; in other words, \$66.36 more per acre per year was made from the tilled plat after deducting expenses than was made from the sod plat. This means that for every dollar taken from the sod plat, after deducting the cost of growing and harvesting the apples, one dollar and eighty-nine cents was taken from the tilled plat each year for ten years. With us there is need for no more proof as to which method of culture is the best.

* U. P. Hedrick, N. Y. Agr. Exp. Sta. Bulletins 314 and 383.

CONCLUSION

Although we realize that in some sections, where the soil is too steep or too rocky or where abundant moisture happens to be present, some other form of orchard culture may be the most profitable, still we fruit growers who have had a chance to study the two methods of orchard culture tried out side by side believe that, under our conditions in western New York, the tillage and cover crops system is far superior to the sod mulch method. In fact, the sod mulch method is absolutely detrimental to the trees. Whenever a person is undecided as to which method of culture to use, he should by all means try out two or three methods side by side. Only by this means can a fair and just comparison be made.

FERTILIZERS FOR FRUITS

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.

I shall discuss briefly several comparative tests of fertilizers for fruits made at the New York Agricultural Experiment Station.

The first was carried on for twelve years in an old apple orchard, in which the trees had practically completed their growth before the experiment began. The soil was a heavy clay loam, fairly typical of the majority of the orchards of western New York. For twelve years, applications of potassium, phosphoric acid, and lime were made on an orchard forty-three years old at the beginning of the experiment. There were some slight gains in yield for the fertilized trees, but there was no difference in color or keeping quality of fruit between crops from fertilized and unfertilized trees. Practically, if not strictly in fact, the results were negative. The data showed that it was not profitable to apply potassium, phosphorus, or lime to the soil of this Station orchard; that fifty-five years of cropping had not reduced this soil to a condition where it needed a "complete" fertilizer. Stable manure or cover crops plowed under in this orchard usually showed beneficial results the same or the next season. It would be an assumption to say which it is — the food or the condition of the soil brought about by the organic matter, or both — that proved beneficial when manure and cover crops were plowed under.

The second experiment was with young apple trees and began in the spring of 1896. Ben Davis stock set in April was top-worked to Rome Beauty in July, the buds having all been taken from one tree to avoid variations. The orchard was laid off in twelve plats of five trees each. In plats 1 and 9 stable manure was used at the rate of five tons per acre; plats 2 and 8, acid phosphate at the rate of 350 pounds per acre; plats 6 and 10, acid phosphate and muriate of potash—350 pounds of the first and 200 pounds of the second; plats 4 and 12, the above amounts of acid phosphate and muriate of potash, plus 250 pounds dried blood and 95 pounds nitrate of soda; plats 3, 5, 7, and 11 were checks.

The first application of these fertilizers was made when the trees were three years old, and fourteen applications have followed. Tillage has consisted of an early spring plowing and cultivation until about the first of August, followed by a cover crop of some non-leguminous plant. What are the results?

The orchard bore its first crop of fruit in 1902, when the trees were six years of age, and it has borne nine crops since. An examination of the individual records of the sixty trees and of the twelve plats, for seven crops, shows only negative results.

In any way the data are studied, it is impossible to find a decided benefit from one treatment over another. The nitrogen applied is mostly lost. The potash and phosphoric acid are stored where "neither moth nor rust can corrupt." The storage, however, of these two food constituents in a soil such as ours, where there are already from fifty to one hundred times the quantities of them needed, is unprofitable business. One might as well gild gold, paint a rose, or throw perfume on a violet.

These are the facts, but facts signify little or nothing unless they fit into a theory. Farm and garden crops on the Station grounds respond to application of fertilizers. Why do not apples? The answer probably is that there is an abundance of plant food in the soil, and the apple plant is preeminently able to help itself to what is set before it.

That there is an abundance of plant food in most cultivated soil, many chemists now agree. In a wheat field in Rothamsted, England, it was found that on land cultivated for centuries and then subjected to fifty-four years' continuous cropping with wheat and without fertilizers, there was still nutriment enough for a hundred or more full crops. Much of this food is not available, but it now seems that by the regulation of the moisture and by putting organic matter in the soil whereby we secure the solvent action of humus and of the bacteria that thrive in humus, much of the unavailable plant food in a soil may be made available. How much, it would be an assumption to say, as there seem to be no experiments to prove this point. Indeed, to attempt to prove it would make a problem so complex as to be almost impossible, and so variable for different soils as to require a solution for each particular soil. Notwithstanding the lack of definite proof

as to how much of the unavailable plant food in a soil may be made available, I think it may be safely said from theoretical deductions that the yearly plowing, the continuous tillage, the well-regulated supply of moisture, and the addition of humus by plowing under cover crops, have made available the plant food which the apple trees in these two experiments needed.

A once favorite theory which may still hold regarding fertilizers is that the composition of the crop is a good guide to the fertilizer requirements of that crop. Very unfortunately, there have been almost no well-conducted, long-continued experiments to ascertain what the fertilizer requirements of fruits are. In America, there have been less than a half dozen experiments, planned and carried out for more than two years, which by any stretch of imagination could be called fertilizer experiments. Therefore, having no definite data for the apple as to fertilizer requirements, practically all of our recommendations for fertilizing this fruit are based on the differences in the chemical composition of this plant as compared with the composition of grain and garden crops. But the fertilizer requirements of fruits cannot be correctly apprehended by comparing chemical composition of trees, bushes or vines with those of grain and garden crops, because their habits of growth are entirely different from those of the other crops.—These differences in growth need to be kept in mind whenever the temptation arises to draw comparisons between the fertilization of orchards and of fields or gardens. Let us sum up the chief differences.

Trees have a preparatory time of several seasons before fruit-bearing begins; farm and truck crops make their growth, bear a crop and pass away, for the most part, in a single season. Trees begin to grow early in the spring and continue until late fall; few annual crops are in active growth more than half the time when leaves and roots of trees are at work. The roots of trees go much deeper and spread relatively farther than do those of succulent crops. Such data as are at hand seem to show that fruit transpires a greater amount of water in proportion to its leaf area than do most succulent plants, which means that the nutritive soil solution may be less concentrated than for grains and vegetables and yet feed the fruits equally well. Fruit crops are from 80 to 90 per cent water, and the leaves mostly remain on the ground; in

field crops the product has a much higher percentage of solids, and the roughage is not usually returned to the soil. These differences in manner of feeding and in the crop taken from the ground largely account, to my mind, for the lack of results in applying fertilizers in orchards, while in adjoining fields, farm crops have abundantly repaid the cost of fertilizing them.

Almost as barren of results as in the apple orchard are experiments carried on with commercial fertilizers for grapes in Chautauqua County, the chief grape region of New York, fertilizers having been applied in six vineyards on different soils for five years. The results are confusing, contradictory, and unsatisfactory, but from them in well-tilled vineyards only the use of nitrogen as a commercial fertilizer could be encouraged — phosphorus, potassium, and lime being usually wholly or so nearly inert as not to be profitable.

Seven other experiments, all deciduous tree fruits being included, are under way in different parts of New York, the number of seasons for each varying from one to five. It is too early to draw conclusions; but the indications are that nitrogen is most often the limiting factor, that phosphorus is only occasionally needed, and that, in these New York soils, potassium and lime are very seldom needed for fruits.

What conclusion can be drawn from these several experiments? To me they indicate that in orchards and vineyards, if well drained, well tilled, and properly supplied by organic matter from stable manure or cover crops, commercial fertilizers are little needed. The exceptions will largely be found on sandy and gravelly soils deficient in potassium and phosphate and very subject to droughts; on soils of such mechanical texture as to limit the root range of the plants; in soils so wet, so dry, so devoid of humus or so close in texture that soil bacteria do not thrive. These exceptions mean generally that a soil possessing them is unfitted for fruit culture. There may be some orchards now receiving good care and planted on naturally good soils that require additions of one or possibly two of the chief elements of plant food. Few, indeed, require a complete fertilizer. What these special requirements are can only be decided by tests with the several fertilizers, and are probably not ascertainable by soil analysis.

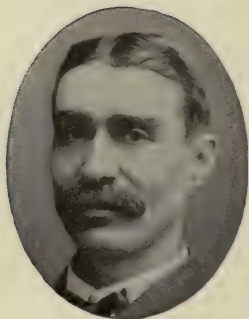
These conclusions are somewhat revolutionary, but I believe that they may be properly deducted from the experiments discussed, that they are substantiated by experiments elsewhere and that they are abundantly confirmed in fruit-growing experiences.

I cannot close without further emphasizing the importance in orcharding of paying attention to all the factors which contribute to plant growth as well as to the supply of food. Such factors as moisture, soil temperature, aeration and the texture of the soil must not be neglected. Any of these, or any combination of them, as well as the supply of food, may be the factor which limits the yield in an apple orchard. Moisture is often the limiting factor — in my opinion most often the limiting factor — carrying away plant foods in open soils and restricting the root run on heavy soils; in either case the plant may starve although food be present, because there is not opportunity for the plant to take up the nutritive solution in sufficient quantity. It is only when the water supply is perfectly adjusted that there can be a fair test of the plant food resources of a soil. The same is true in a lesser degree of the other factors named.

CARE OF YOUNG TREES

WILLIAM HOTALING, KINDERHOOK, N. Y.

Farmers' Institute Lecturer



In the setting of orchards the first thing of importance to get clearly in mind is that for best growth and development trees require the same conditions as do any other plants. It necessarily follows that the better the preparation given the soil before planting, the more satisfactory will be the condition of the trees during their early life, all other things being equal. Under certain conditions, to be sure — for example, when moisture and plant food are sufficient and available — young trees may really grow well even though almost no preparation is given. In most cases, however, it will pay to fit the ground as carefully for planting young trees as for a crop of corn.

LAYING OUT ORCHARD

There are a number of simple and easy methods of laying out an orchard. If one wishes a rapid and efficient method and can drive a horse straight, perhaps the most desirable practice may be the setting up of stakes at desired distances on each side of the field and furrowing straight from side to side. Cross-furrowing may be practiced in like manner, and the holes may afterward be dug where the furrows cross. If a little care is taken, trees may be set very straight in this manner. The apple orchard will probably stand as a monument to our memory long after we are gone, and for a thing so permanent as this promises to be, I believe we can well afford to take a little extra care in the laying out, as it may mean the difference between shame and pride during the remainder of our lives.

Although somewhat slower, one of the best methods is that of using stakes and a tape measure. It is generally desirable to

have the rows in one direction parallel to a road or fence line, and in using the square method it is also essential that the rows should run at right angles. The following procedure has been found advisable: Place a stake at either end of the plot on a line parallel to the fence and at least one-half as far from it as the distance to be left from row to row; set a row of stakes straight between these two points. In order to obtain the right angle, measure back in a straight line twelve feet and set stake. Then from the corner stake at as near right angles as possible run tape sixteen feet and drive another stake. When the distance between stake set at twelve feet and the one set at sixteen feet is twenty feet, you have an exact right angle. Now sight over the stake at the corner and the one set sixteen feet away, and on line with these set one at the far side of the field. Then run a line of stakes again at desired distance apart between corner stake and last stake set, when you will have your two base lines, and by measuring each way may run the rows in either direction.

Distance Between Trees

The distance at which trees should be set, or rather the number it is best to set per acre, must always depend on the individual orchard. If one wants to grow an orchard of moderate size, on a farm where regular farm crops are to be grown between trees until they come into bearing, then one should by all means use only standard trees, and plant at a good distance apart. If, however, fruit growing is the principal end in view, and especially if other kinds of fruit are grown, such as bush fruits and strawberries, other varieties and some of the small fruits can be interplanted. If the selections are wise, the net return per acre will be increased each time we increase the number per acre within reason, because of the reduction in overhead charges and because there is always something growing on the ground at a minimum cost for labor. Here we have the two extremes, both highly practical under certain conditions, and every man's best choice of distance lies somewhere between. From forty to fifty feet for the larger spreaders, such as Spies, Baldwins, or Greenings, and twenty-five to thirty feet for small-growing fillers, such as Wealthy, Oldenburg, or Sutton, is advisable.

Different Systems of Setting

Much has been said pro and con, concerning all systems of planting, yet a decision must always be somewhat a matter of personal choice. At this time only two methods, or some modification of them, are used to any extent. The first is the so-called square

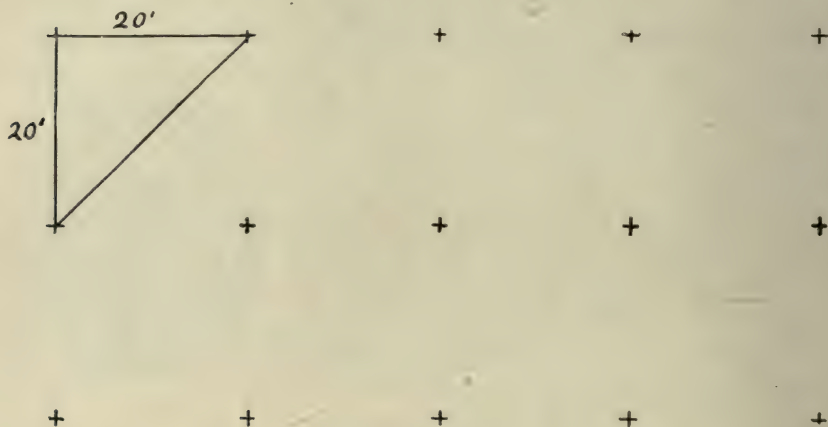


FIG. 216.—SQUARE METHOD OF PLANTING

system, in which the rows run at right angles to each other in two directions; the second is the equilateral-triangle system, in which all trees are set at the corners of a sixty-degree-angled triangle, so that each tree has an equal distance from all other trees in every direction (see diagrams). The advantages of the equilateral method are that a greater number of trees may be set per

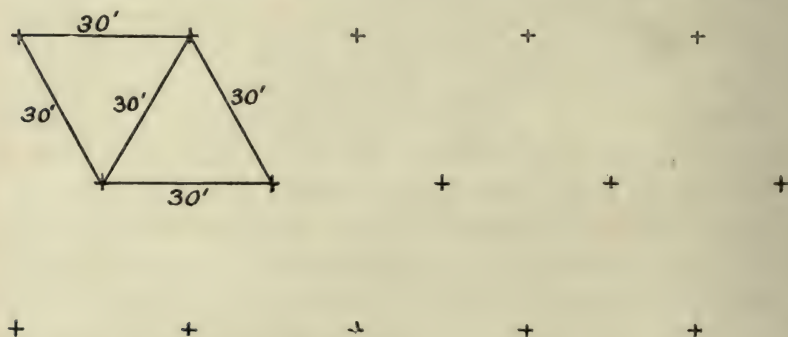


FIG. 217.—METHOD OF PLANTING IN EQUILATERAL TRIANGLES

acre with equal allowance for spread and a better exposure to sunlight; on the other hand, the advantages of the right-angle method are greater ease in working and better adaptation to thinning.

Pruning at Time of Setting

Pruning at planting time must always vary according to the previous growth of the tree. The general principles that govern pruning may be outlined as follows:

1. So far as possible such laterals should be preserved as will give an ideal type of framework to the tree later on.

2. The better the distribution of laterals along the stem, the less is the liability to breaking later.

3. The distance between laterals does not change materially as the tree takes on growth. Therefore, those that seem far apart in the young tree will sometimes be much too thick when the tree is older.

4. The strongest growth will always be from the last bud left on the new growth; it is therefore important that we should cut to a bud pointing in the direction in which greatest growth is needed.

5. The more severely we prune a tree when dormant, the stronger it will grow, and the same holds as true at planting time as at any other.

6. As trees come into bearing the limbs have a natural tendency to droop; it is therefore wise to prune in such a manner as to induce short, rigid growth during the early life of the tree. This can be done by shortening in, but not by indiscriminate cutting back.

All of this points to but one conclusion,—pruning at time of planting must depend on size of trees, variety, and type of tree desired. For example, while we could start an ideal tree in almost any manner, we are always obliged, when we have a whip or a crotch tree that must first be trimmed to a whip, to content ourselves with topping it to the height at which we desire the laterals to start. No specific rule can therefore be laid down that will answer at all times, but all growers should understand the principles and be governed according to conditions.*

* See article on pruning, page 830.

FALL OR SPRING PLANTING

Both fall and spring planting have their advantages. In fall, planting can be given greater attention because other work is not so pressing at that time. If planting is done in the fall, we should always be certain that our trees are grown as far north as we are located. Otherwise they may not be properly ripened and will probably kill back more or less, since they do not have the same opportunity to become acclimated as after spring planting when the change from summer to winter is gradual.

In spring planting, the things of most importance are: first, that our trees have been properly wintered; and, secondly, that they are well tamped at time of planting. A greater number of spring-set trees are lost from improper tamping than for all other reasons combined. There is usually moisture enough in our soils for good growth in any season, if the soil is properly handled. The only way the soil water can be conveyed to the roots of the trees, however, is by capillary action, which means that soil water must pass up from one soil particle to another. This it can only do when soil particles are in close contact one with the other, and such contact is attained by hard tamping. Air spaces cut off this movement of water, and such spaces always exist when the soil is not well packed. While tamping is desirable in the case of fall-set trees, it is not so important because the ground settles in spring and naturally takes on this condition.

CULTIVATION

As stated at the beginning, trees are dependent on the same agencies for growth and development as are other plants, that is, on available plant food and moisture. Under average conditions these are in almost exact ratio to cultivation. That being true, it necessarily follows that for the best results cultivation of some kind should be given. How this can best and most economically be practiced must depend somewhat on the individual orchard. The young orchard lends itself readily to growth by intercropping with small fruits or hoed crops. Wherever practical, then, cultivation may be given in this manner; or cover crops may be used as set forth elsewhere in this bulletin. The point to be kept in mind is that cultivation of some kind is generally desirable, and necessary for satisfactory growth of the young orchard.

VALUE OF SPRAYING

Many people seem to think spraying unnecessary until trees come into bearing. True they will often remain alive without it; so will a calf without grain. I am certain, however, that the time has passed when our only ambition is to keep growing things alive. What we want is best and most economical development, or the largest returns for a dollar's worth of labor and money spent.

After years of trial and practice, I feel sure, because of the small expenditure of time and money necessary, that it pays and



FIG. 218.—CHERRIES INTERPLANTED WITH CARROTS

pays well to spray trees from the time they are set throughout their entire life, both with the dormant and foliage sprays. This is especially true in the case of the grower who has a considerable amount of spraying to do, because it requires so little additional time and material to spray the young trees. For those who have no other spraying to do, it inculcates good habits that will later be invaluable in fruit growing.

The Dormant Spray

There are still other reasons why young trees should be sprayed. The dormant spray is valuable, first because it is a specific for all

scale insects; secondly, because by destroying the egg masses it is the most economical and efficient method for the control of tent caterpillar; thirdly, because there is always more or less fungi and insects other than those mentioned that it will control; and fourthly, whenever San José scale is present we can hardly expect to retain our trees alive without it.

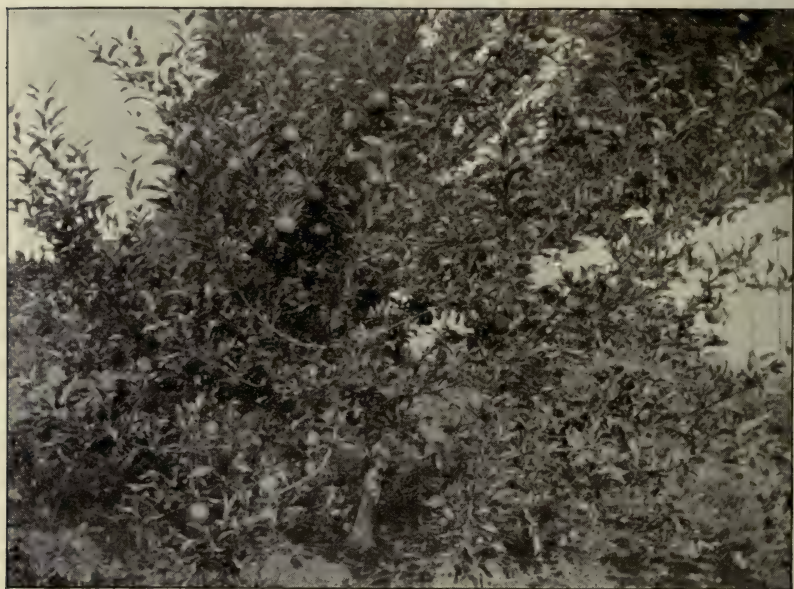


FIG. 219.—LOW-HEADED, WELL-SHAPED APPLE TREE

The Foliage Sprays

Trees take their food in the same forms as we do, which means that before they can make use of food in their growth and development it must all be elaborated through the leaves which the trees bear. It is therefore essential that the leaves be in the best possible condition in order to perform their function, which they can do only when free from fungi and from insect injuries, both of which can best be controlled by proper spraying. All spraying is dependent on a proper mixture applied thoroughly at the right time, for success.

If we were to make a separate application for each of the great number of orchard pests, including fungi and insects, we should be spraying all the time. Happily for us this is not necessary.

Ingredients may be used in combination, so that one application will control fungi and insects of different habits, and by proper combinations often two applications will suffice for good work. This is especially true in the Hudson River section, but not so true in western New York, where a great number of applications are often necessary for the control of the second brood of the codling moth and apple scab.

In this work one point should never be lost sight of; that is, regularity of spraying will always give better results than occasional applications, no matter how thorough the latter may be.

CARE OF THE OLD ORCHARD

ROY P. MCPHERSON, LEROY, GENESEE Co, N. Y.

Farmers' Institute Lecturer



Scattered throughout the state are numerous apple orchards worthy of attention. To those who have given care to such orchards have come returns in fruit and cash and in the satisfaction of seeing Nature's response to the assistance of man. To be sure, there are old orchards whose days of usefulness are past. However, many apple orchards from thirty to sixty years old can still be made to bloom and bring forth perfect fruit, provided the orchard consists of fairly sound trees of good varieties.

ESSENTIALS OF TREE GROWTH

It is much easier for one to handle an orchard with profit if he knows the essentials of tree growth. These essentials are, water, nitrogen, and the mineral elements from below, with sunshine and carbonic acid gas from above, together with healthy trunks, branches, and leaves.

The feeding roots of all plants are covered with minute hairs which take up water from the soil, together with mineral matter and nitrogen compounds in solution. There are no direct openings in these root hairs, the material being taken up by diffusion. In the leaves of plants—mostly on the under side—are minute openings leading into the interior. Air passing through these carries carbonic acid gas, which is absorbed by the leaf cells. Also, the water taken up by the roots is carried by the trunk and branches to these cells. The carbonic acid gas and the water, meeting in the cells, are broken up and rearranged by the action of sunlight and the green coloring matter or chlorophyll of the leaf. The result of this union is a new substance called starch. The leaf, then, is a starch-manufacturing center, each cell a starch



FIG. 220.—A WELL-KEPT ORCHARD ON THE HORNING FARM, PHELPS JUNCTION, N. Y.

machine, uniting the crude materials — water from the soil and carbonic acid gas from the air — into the great plant builder, starch. The wall of every plant cell is made of starch supplied by the leaf cells.

Hence, for best results in apple production we must assist Nature. Nature, when left to herself, may bring forth small, inferior, and undesirable fruit. Man's part is to see that the essentials so necessary for best production are all supplied. To preserve the proper conditions in soil and tree-top, four things are usually indispensable — cultivation, fertilization, pruning and spraying.

CULTIVATION

Except under some unusual conditions of sidehill location, where moisture comes freely from above, or where the trees are kept heavily mulched, cultivation is absolutely necessary. The orchard should be plowed in the early spring, when the soil is filled with moisture, and cultivated or thoroughly stirred, enough to keep a dust mulch on the surface. The dust mulch checks evaporation by breaking up capillarity and conserving the moisture, which is used by the tree roots. Cultivation should cease not later than the latter part of July.

FERTILIZATION

We think first of fertilization as the use of chemical fertilizers. Not so with the apple orchard. When the crop is harvested, only a very small amount of potash, phosphoric acid, and nitrogen is removed. Experiments by the State Experiment Station at Geneva, and elsewhere, show conclusively that the use of commercial fertilizers on well cultivated orchards does not pay. Best results are obtained by the use of barnyard manure or cover crops. Cover crops are sown when cultivation ceases, and are plowed under the following spring. For this crop, red clover, hairy vetch, or some other leguminous plant is used. By plowing under the manure or cover crop, vegetable matter—an element which nearly all soils lack — is incorporated into the soil. Vegetable matter increases the water-holding capacity of the soil; and, when it decays, it not only adds nitrogen, but strengthens the soil waters, giving them power to dissolve some of the potash and phosphoric acid already present.

PRUNING

The purpose of pruning is to admit light and air to the surface of each and every leaf on the tree. Otherwise the leaves cannot perform their function of making starch. The objective point of every orchard owner is to make every tree produce as many and as large apples as he can. This takes starch, which can be made only by the leaves. The leaves cannot make it without light. Thus comes the necessity of pruning so that light can penetrate to every part of the tree. Apple trees on which the lower limbs are dying have usually been brought to this condition by tightly locked top branches through which the light cannot penetrate.



FIG. 221.—SPRAYING THE ORCHARD

There are two types of branches—water sprouts, which grow straight upward, and branches bearing fruit spurs. In pruning, all water sprouts should be removed, as well as nearly all branches growing vertically, because they interfere with or shut out the light from other branches. Leave only those bearing branches which grow more horizontally and thus make flat, fan-shaped branches. It is unwise to prune trees so that the bearing branches are only at the ends of the limbs. Fruit spurs should be found all through the tree.

Pruning should be done annually in early spring before the growth starts. Trees should never be pruned excessively, as is

usually done in spasmodic pruning. This causes water sprouts. Branches should be cut off close to the limb.

SPRAYING

The reasons for spraying are to protect the leaf, which makes the starch, and to save the fruit from insects and fungi, which spoil its appearance and salability. Spraying must be done promptly and thoroughly — promptly because thus the insect are more easily and completely destroyed, and thoroughly so that every leaf is coated. To do this, it is desirable to drench the tree so that no part may escape. This will be much more easily accomplished if the tree has been properly pruned.



FIG. 222.—APPLE ORCHARD IN BLOSSOM — THE WRONG TIME TO SPRAY

There are two enemies to be controlled — insects and fungi. Insects may be classed either as the chewing or sucking species. The chewing insects can be destroyed by a poison such as arsenate of lead, sprayed upon the leaf or fruit. Sucking insects are destroyed by a contact spray, which kills by striking their bodies. Soap or tobacco extract is used. For fungi, the leaf or fruit must be sprayed previous to attacks. The fungicide bordeaux mixture or lime-sulphur is used.

The first or dormant spraying is applied as the leaf tips appear. The spray used is commercial lime and sulphur, testing 32 degrees

Baume, or home-made lime and sulphur in amounts according to its density. If San José scale is present, one gallon commercial lime and sulphur to eight gallons of water should be used; for blister mite, use one gallon to eleven gallons of water. Two pounds of arsenate of lead paste (or one-half the amount of dry arsenate of lead) should be added to each fifty gallons of solution as a spray against the bud moth and other chewing insects. When red bug or apple aphid is prevalent, add three-fourths of a pint of tobacco extract (40 per cent nicotine) to each hundred gallons of dilute lime and sulphur.

The second spraying is used mainly in those localities where the scab fungus is very common. Cloudy or damp conditions are most favorable for its development. The spray should be applied after the individual flowers in the cluster separate from one another, but before they can open into full blossom. Just at this time a spray is applied, consisting of one gallon lime and sulphur to forty gallons of water, with two and one-half pounds arsenate of lead paste to every fifty gallons of the mixture. The lime and sulphur protects the leaves and fruit stems from the scab, and the poison arsenate destroys any insects that may be feeding upon the foliage.

The third spraying is against the larvæ of the codling moth. These larvæ feed in the blossom end of the apple. When the petals fall the calyx is open, and this is the time to spray. The calyx soon closes and retains the poison inside, ready for the young caterpillar's first meal. After the calyx has closed it is too late to spray effectively. The spray used is the same as for the second spraying. Lime and sulphur is again used, because of the prevalence of scab and other fungous diseases. If the red bug appears, tobacco extract should be added.

The fourth spraying is applied the last of July against the late brood of the codling moth and the late attacks of the apple scab. It is this larva which makes the ugly looking holes in the side of the apple. The spray consists of lime and sulphur and poison of the same strength as in the second and third sprayings.

PRUNING

EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

Director of Farmers' Institutes

In order to cover the subject of pruning in the most concise way, I preface what I have to say by a question—"Why do we prune?" and answer by giving three chief reasons in the order of their importance:

1. To grow a shapely tree, one that will be symmetrical in form, with the branches so placed that the danger from splitting under a heavy load of fruit or when covered with snow and ice will be



FIG. 223.—BALDWIN TREES, 15 YEARS OLD, AND THE PRODUCT OF A SINGLE TREE, IN ORCHARD OF EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

reduced to a minimum, also in order that the branches may be so formed as to carry the fruit with the least danger from breaking.

2. To remove diseased or broken twigs or branches and superfluous growth.

3. To allow light and air to penetrate, thus reducing the dangers from fungous troubles, increasing the color, and at the same time making thorough spraying possible.

Other reasons may occur to the experienced orchardist, yet I am sure a careful analysis of the situation will show that they are nearly all embraced in the above trinity. This question and the answers imply that the pruning should never be done merely from habit or because it is a part of orchard practice, but only for specific reasons.

MOST TREES OVERPRUNED

Taking the orchards as a whole the country over, I am sure that there is too much rather than too little pruning. This is true in spite of the fact that frequently we see orchards containing so many dead and diseased branches and the living ones so thick as to preclude the possibility of the fruit ever attaining size or color. Not infrequently the infected limbs are the result of unwise pruning, and when such orchards are taken in hand they are likely to be so overpruned as to destroy in part or as a whole their future productiveness. A safe and wise rule to follow is never to take out a branch or twig without a good reason. When once removed it can never be put back, but if left it can be removed at any time; in a word, prune as little, not as much, as possible. At the same time, grow and maintain a symmetrical and well-balanced tree, free from disease and mutilated branches and superfluous growth, such as "suckers," or water sprouts, and one that is left open enough to allow free circulation of light and air.

No one can prune intelligently unless he is gifted with imagination. He must be able to form a mental picture not only of how the tree will appear immediately after pruning, but also of what its form and general condition will be a decade hence.

PRUNING YOUNG TREES

Following the statement of these general principles, I will take up in logical order the matter of pruning, beginning with the young tree. This, too, has usually been overdone. One must consider the age of a tree and its variety as well as the vigor or the lack of it. A yearling can frequently be trimmed to a whip or single stalk to advantage, since comparatively little growth has to be removed, and danger of shock to the tree is avoided. The root system in such trees is small and does not require the same amount of leaf surface to sustain it as does an older tree. It should always

be borne in mind, however, that the tree must be sustained entirely from the air through its leaves until the threadlike fibers start from the roots and can obtain sustenance from the soil. Older trees, therefore, should obviously not be pruned in this way; neither is it wise to cut them back severely.

The top, of course, should not be out of proportion to the roots. The most approved present-day practice is to remove injured roots or twigs and shorten branches unduly long, but otherwise to leave the top untouched. If one can devote the time to this work at the proper season, much of the shaping and training can be done with the thumb and finger in pinching and rubbing off embryo buds or branches. Experiments at the New York Agricultural Experiment Station with various kinds of young trees plainly indicate the soundness of the above advice. From year to year the same general line of pruning should be followed. It is surely not good business to tax the soil to grow wood to be cut off. This emphasizes the unwisdom of so forcing the young tree during its formative period as to result in a rank, succulent growth which must be removed in order to prevent the tree from becoming top-heavy. Furthermore, such forcing tends to postpone the period of fruitage. Like men and women, trees become creatures of habit, and by forced feeding and pruning they may get into the growing rather than the bearing habit. Most varieties of apples bear their fruit on two-year-old wood and on the terminal buds. To cut back in such a manner as to destroy this wood and these buds certainly prevents fruiting, while to cut back the ends of the young limbs is to remove the terminal buds and induce a rosette growth, or cluster of twigs, at the place of cutting, a most undesirable condition.

LOW-HEADED TREES

The height of the first or lower branches should be determined at the time of setting, as the distance from the ground at which they are started will remain the same during the life of the tree. The importance of low heading is my warrant for a slight digression from the real subject of pruning to state reasons for such heading. By a low-headed tree I mean that in upright growers, such as the Baldwin, the first branches will be between two and three feet from the ground, and those like the Greening that are

more spreading in their habit, about three or four feet from the ground. Trees so headed can be much more economically and thoroughly sprayed, and all orchard operations other than cultivation can be done more easily, a fact particularly true in the case of picking. Such trees are also less liable to injury from the wind; and dropped fruit suffers little injury by falling. Furthermore, all evidence goes to show that they bear earlier than a high-headed tree. Sometimes the objection urged is that they cannot be so well cultivated, but this is more seeming than real. In order to go very close to the tree, the branches must be so high that a horse can pass under them without striking the hames. Eventually all such lower



FIG. 224.—GREENING TREE 22 YEARS OLD, HEADED FOUR FEET FROM GROUND, ON FARM OF EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

branches decay and must be removed, with the result that all trees headed thus high become top-storied and make undesirable stock.

The writer has done more injury to his trees by very close working than he has realized benefit from the practice. With modern orchard tools, cultivation can be done under the low-headed tree as close as is necessary. After the branches cover the ground little will grow under them; and, in any event, deep cultivation close to the tree is always to be avoided.

PRUNING IN SECOND AND IN SUBSEQUENT YEARS

By a system of pruning that inclines the tree to an upright growth with fruit spurs toward the base of the main branches, and one that is assisted by the natural tendency of trees to grow in such a direction, a symmetrical and productive tree can readily be obtained. If pruning during the growth period has been such as to leave a symmetrical tree free from surplus branches, the pruning will consist chiefly in removing annually small interlocking branches, and in shortening overambitious ones, or such as would eventually make the tree too high. In the best regulated orchards there will occasionally be broken, diseased, or dead branches. These, of course, should be removed both from the tree and from the orchard, for in either case their presence is likely to become a source of infection. Pruning should be an annual operation, not a spasmodic one. The reasons are obvious. It should be done in such a manner that the fruit buds are distributed over the whole limb rather than on the extremities, as the tree will then carry its burden of fruit much better. It will also be found that fruit on the interior branches of the tree will stand untoward conditions when that on the outside is destroyed. If the tree is kept properly open, such interior fruit will not lack sufficient color. In New York State with its hot summers, the tree with the close rather than the open top is to be desired. Spaces that are too open may be gradually filled by the judicious training of neighboring branches. Occasionally a water sprout may be used for this purpose, although the latter never makes a desirable branch, since its upright growth renders it liable to breaking or blowing out, and its fruit spurs are too far apart.

THINNING

In the case of neglected or too closely planted trees, thinning is frequently necessary, but at the same time serious injury is often done by unwise or undue cutting. Too often if there is too much wood an entire limb is cut out. While this reduces the bearing surface, it does not reduce the number of fruit spurs on the limbs remaining. They are then more likely to overbear and break later; besides, unsightly gaps are left. The removal of a large limb is always a shock to the tree, and often results in permanent injury. This is certain to be the case if a large surface is left exposed where bacteria and diseased fungi may find lodging, also



FIG. 225.—LOW-HEADED APPLE TREES ON FARM OF L. L. MORRELL, KINDERHOOK, N. Y.

if a stub is left or if the cut is too close to the main body of the tree. When large limbs must be removed, the cut should be made slightly above the branch or trunk from which the limb is removed, but not high enough to leave a stub, the cut being made so as to leave as little exposed surface as possible and in a slightly sloping direction in order to shed water. A most excellent plan is to cover the wound immediately with lime and sulphur containing a considerable sediment, which acts as a disinfectant and as a protectant as well.



FIG. 226.—GREENING TREE IMPROPERLY PRUNED; TOO MUCH OF CENTER REMOVED. IN ORCHARD OF EDWARD VAN ALSTYNE & SON, KINDERHOOK, N.Y.

When trees are too close, limbs are often shortened — a practice that at best is of doubtful merit, for, unless there are twigs left beyond the cut to draw the sap, the wound will never heal and the limb will begin to die from the cut inward. Usually it is much better to remove an entire tree, since the roots will be as much too close below the ground as the branches are above it. For a year or

two there will be a slight decrease in bearing wood, but this will be more than compensated by the better size and general appearance of the fruit on the trees remaining. The wisdom of such a course has been proved in many New York orchards where this kind of thinning has been done.

CUTTING BACK, OR "DEHORNING"

Cutting back is often recommended for high trees that are difficult to spray and in which one must ascend toward heaven in order to gather the fruit. At best this process is but a makeshift.



FIG. 227.—HIGH-HEADED APPLE TREES, 60 YEARS OLD—SPITZENBURG AT THE LEFT—GREENING AT THE RIGHT. IN THE ORCHARD OF EDWARD VAN ALSTYNE, KINDERHOOK, N. Y.

If the tree is high-headed—and such trees usually are—there will be little bearing surface left after the top is removed, as may easily be seen from the tree shown in Fig. 227. If the dehorning is severe, the tree will eventually die. Usually it is better economy to “lay the axe at the root of the tree,” and devote one’s energies to a young tree properly trained from its youth up. I would not, however, be understood as saying that trees may not be so pruned as to reduce the height of the top and to induce a more spreading growth. In many cases this may be done by heading in the side

branches, so as to keep the fruiting surface toward the center of the tree. In such and all other pruning, the variety must always be taken into account.

TIME OF PRUNING

Here, as always, certain underlying principles must be kept in mind. Pruning when the tree is dormant always induces wood growth. The sap is stored in the roots in proportion to the top of the previous year. If a part of the top is removed when the tree is dormant, the sap must be distributed in the wood remaining, and a more vigorous growth must necessarily result. This is illustrated by the number of water sprouts on a tree that has been severely pruned. Nature is always working to preserve a proper balance; when man destroys wood growth, Nature makes a supreme effort to supply what has been lost.

When the tree is in full leaf, the sap being distributed as Nature intended, pruning has a tendency to induce fruiting. The shock to the tree at that time is greater. Just as in the case of amputating the limb of a man, the shock is much less if the patient has been quiet with little blood-producing food than if his arteries and veins are full of blood pumped from the heart; so in the case of a tree. Another law of Nature is to reproduce. When life is threatened in animal or plant, the reproductive powers become more active in order that the species may be preserved. With these facts in mind it can readily be seen that in the case of a weak tree or variety, or one bearing heavily, where wood growth is desirable, winter pruning — and it may be severe pruning — is the proper course. On the other hand, for a tree growing too much wood or being like the barren fig tree at the time of fruitage, pruning when dormant or severe pruning only increases the difficulty. In such cases, summer pruning may be desirable, but they are the exception, not the rule. Usually most of the pruning may be done after the foliage has dropped, at which season the right sort of labor is more easily obtained, since other work is not pressing. It is also much simpler to determine what to take out at this time, and the bark does not slip so easily. However, I should prefer not to prune until the wood is thoroughly hardened for the winter or when the weather is extremely cold and the trees are full of frost.

TREE SURGERY

In an article of this character I cannot refrain from warning my readers against the professional (?) tree surgeon or butcher. Such are in evidence in every community, urging their services on the unwary at a price not much lower than that charged by the local horse doctor. I have seen productive orchards ruined by these men whose ruthless slaughter of bearing wood indicated either their ignorance or a desire that they might make a show. "Verily they have their reward." At other times they class them-

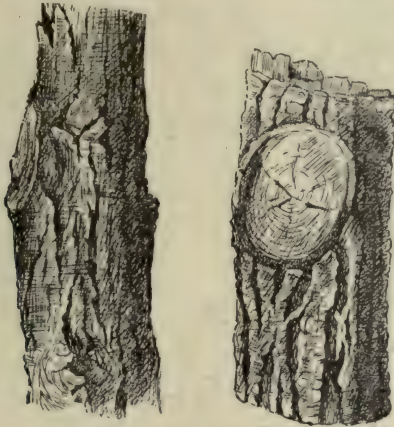


FIG. 228.—SIDE AND FRONT VIEWS OF A PROPERLY-MADE CUT. THE BULGE AT THE BASE OF THE BRANCH HAS BEEN REMOVED, LEAVING NO STUB. THIS WOUND WOULD HEAL RAPIDLY.

(Copied from *Report of Proceedings of the Western New York Horticultural Society*, 1911.)

selves as "healers," and at great expense remove decayed wood and pour in, not "oil and wine" as did the good Samaritan, but a mixture of concrete. Only in the case of some choice tree which it is desirable to preserve for sentimental reasons is this practice to be recommended, rarely if ever for economic ones. In some cases the money expenses in work of this kind would have "fed the hungry and clothed the naked." Such tree surgeons belong in the class with those who sell peach trees grafted on oak roots to make them "hardy" and with others who insert a plug of sulphur into the trunk of a tree at two dollars per in order to render it free evermore from the depredations of insects. All of

them deserve to be in the class "outside the gate with the dogs, sorcerers, and whosoever loveth and maketh a lie."

ROOT PRUNING

Not infrequently advice is given, setting forth the advantages of root pruning, but merely to set the seal of my disapproval on the practice have I introduced the subject here. It is justifiable only

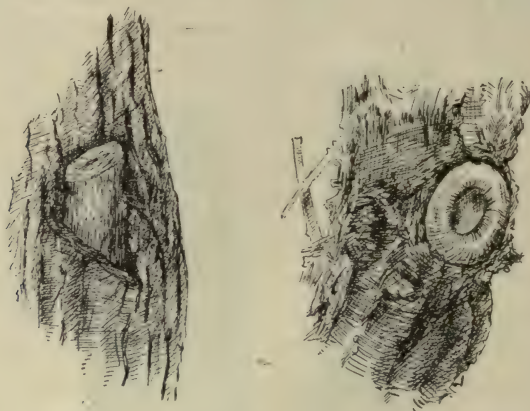


FIG. 229.—IMPROPER CUTTING OF LIMB (LEFT). PROPER CUTTING OF LIMB (RIGHT). THE STUB IN THE FORMER CASE WILL NEVER HEAL. THE DECAY OF SUCH STUBS USUALLY EXTENDS TO THE HEARTWOOD.

(Copied from Report of Proceedings of the Western New York Horticultural Society, 1911.)

when broken or injured roots are removed before setting young trees, and when the ends of main roots are cut slantingly in order that they may rest upon the earth instead of projecting into it. From these shortened ends, root hairs will quickly start, from which the tree may obtain sustenance. In other cases our advice on root pruning is the same as that given by Hoyle in bridge whist as to trumping the trick of one's partner—"Don't!" I have seen most serious injury immediately follow deep plowing when large roots were broken; and late spring plowing, which destroys many of the feeding rootlets, is always to be condemned. While it is true that a severe breaking or cutting of roots in a neglected orchard is sometimes followed by abundant fruiting, such fruiting is the supreme effort of Nature to reproduce, and it is usually

accomplished at the expense of the life or future usefulness of the tree.

PRUNING TOOLS

Pruning tools are few and inexpensive. Always in evidence among them is the saw. An implement with fine teeth should be used for small trees and for large trees a somewhat coarser one with a considerable set, and a narrow back in order that it will not strike branches above when the branch below is severed. It should be unnecessary to say that it ought to be sharp, not only because much better work can be done, but also because a saw that is dull will have the effect of putting the user in the same condition. With it his work will be drudgery, rather than intelligent effort resulting from a mental picture of trees "bearing fruit after their kind" before him.

Clippers are of questionable merit, for although with them time may be gained, nice work is lost, since it is difficult to make a smooth, close cut with them. The clippers on an elongated handle serve a useful purpose in cutting back or removing twigs too high to be reached, but nevertheless one must remember the danger of the rosette end where the cut is not made close to a bud. A sharp, stout pruning knife is to be preferred and occupies second place after the saw. Such a knife should always be the companion of the orchardist when he walks abroad among his trees. The chisel bar for removing suckers is a good tool in the hands of a careful man, but otherwise it is "a sword in the hands of a child."

There is only one place for the axe as an orchard tool and that is to cut down a tree or trim out several branches. A wheel ladder is very convenient and desirable for trimming the outside of trees.

CONCLUSION

We should so order all our pruning operations as to engender fruitfulness and longevity as well as beauty in our trees, keeping in mind the thought of Pope:

"Like leaves of trees the race of man is found,
Now green in youth, now wilting on the ground;
Another race to follow, the spring supplies;
They fall successive and successive rise."

INSECTS PARTICULARLY AFFECTING THE APPLE

DR. E. P. FELT, ALBANY, N. Y.

State Entomologist



Insect pests lay heavy taxes upon the fruit grower. No part of a tree is exempt from injury; the flower, the fruit, the leaf, the twig, the branch, or even the root may be destroyed or at least seriously weakened by insects. Under present conditions, the production of satisfactory fruit without fighting the natural enemies of trees is almost unthinkable.

Young orchards must be protected from borers, plant lice, and scale insect if one would obtain satisfactory growth, and the crop of fruiting trees is subject to material depreciation in value through the work of the codling moth, the apple maggot, and the red bugs.

The methods employed for the control of insects should be planned so as to aid in preventing or checking fungous infection, since it is frequently possible to obtain a double benefit by spraying with a combined insecticide and fungicide. As a general rule, if one is necessary, the other should be added to the spray, because under such circumstances additional protection is secured for the bare cost of the extra materials. Generally speaking, there is no better poison than a good grade of arsenate of lead, and no better contact insecticide than a lime-sulphur wash or a tobacco extract. Oils should be used on dormant trees only when necessary. The bordeaux mixture and the dilute lime-sulphur wash are deservedly favorite fungicides.

The apple tree and its fruit are subject to attack by numerous insect enemies. Scientists have even listed approximately four hundred species as occurring on this tree. Fortunately, however, comparatively few are serious pests, and it is our plan to discuss only the more important insect enemies.

SAN JOSE SCALE

The San José scale, *Aspidiotus perniciosus* Comst., is well established in various sections of the state. It is easily recognized by the dark grayish or yellowish areas on the bark, caused by the masses of old scales or by the grayish black of the young scales. The full-grown insect is nearly circular, with a diameter of approximately one-sixteenth of an inch, grayish, and with a central, darker nipple. The smaller scales are about half the size and are nearly black, while the crawling young appear to the naked eye as minute, yellowish specks.

The most characteristic sign of infestation by this insect is the dark reddish or magenta stain in the greenish tissues of the fruit, the leaves, or the inner bark, as the case may be. With the apple an infestation is most likely to appear on the fruit.

The scale insect winters in a partly grown condition. On the approach of warm weather vital activities are resumed, and crawling young begin to appear toward the last of June. The females continue to produce young for a period of about six weeks, each averaging about four hundred, or from nine to ten every twenty-four hours. The life cycle is completed in from thirty-three to forty days and, practically speaking, there is almost continuous breeding from the time the young appear in the latter part of June until frosts check the process in the fall.

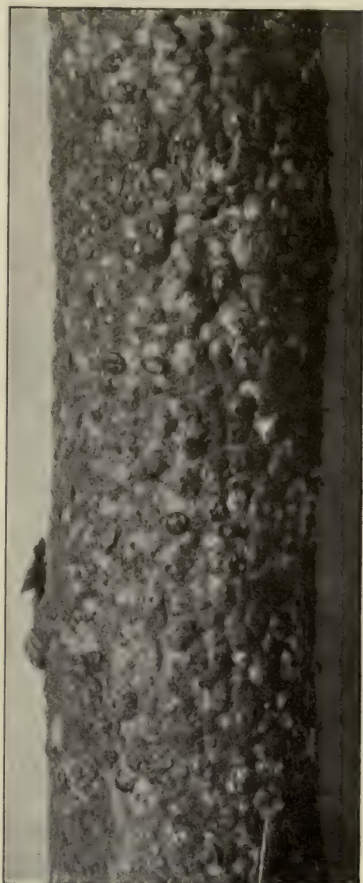


FIG. 230.—SAN JOSE SCALE. TWIG BADLY INFESTED, SHOWING THE IRREGULAR, CIRCULAR HOLES MADE BY THE PARASITES, ENLARGED FOUR DIAMETERS

This pest occurs on a large number of trees and shrubs, displaying a marked preference for the peach, the Japanese quince, and certain varieties of apple, especially Ben Davis and Greening.

Several natural enemies prey on the San Jose scale, notably a small, black lady beetle, *Similia misella* Lec., and some extremely minute and recently discovered four-winged parasites, especially *Prospaltella perniciosi* Tower. The presence of the latter is most easily recognized by the irregular, circular holes made by the insects as they escape through the protecting scale. These parasites may destroy a considerable percentage of the pests, although present conditions do not justify relying to any great extent on their good offices.



FIG. 231.—COMMON SCALE INSECTS: (A) APPLE TREE BARK LOUSE; (B) SCURFY BARK LOUSE; (C) FEMALE, AND (D) MALE SAN JOSE SCALE.

The most satisfactory method of controlling the San Jose scale is by thorough applications of a lime-sulphur wash diluted to about 4.5 degrees Baume and applied during the dormant season, preferably late in the spring just before the buds start, or, under certain conditions, prior to the showing of the pink in the blossom buds. This very late spraying is advisable only when there is an infestation by red bugs, and it is desired to destroy the young of these pests when spraying for scale. A delayed treatment of this character, to which nicotine is added, is very serviceable in checking the latter and plant lice as well as red bugs.

OYSTER-SHELL SCALE AND SCURFY SCALE

There are two common, occasionally abundant, scale insects, one of which is the oyster-shell scale, *Lepidosaphes ulmi* Linn., a

light brown oyster-shell-shaped scale with a length of about one-tenth of an inch. This insect is sometimes so abundant as to fairly incrust limbs, particularly of young trees. The winter is passed in the egg stage, the minute, yellowish young appearing the latter part of May or early in June.

The other common species, the scurfy scale, *Chionaspis furfura* Fitch, is a snow-white or grayish, irregular, somewhat larger scale than the one just mentioned. It likewise winters in the egg stage, the purplish young appearing the latter part of May or early in June.



FIG. 232.—APHIS APPLES SHOWING CHARACTERISTIC DWARFING AND DEFORMATION

Both of these species are usually well controlled in orchards systematically sprayed for San José scale. In case a few trees are seriously infested, a thorough application of any good contact insecticide should be made at the time the young are crawling.

APHIDS, OR PLANT LICE

Three species of plant lice occur commonly on apple trees; namely, the European grain aphid, *Aphis avenæ* Fabr., the green apple aphid, *Aphis mali* Fabr., and the rosy apple aphid, *Aphis malifoliæ* Fitch. An abundant infestation by these insects may result in a large crop of small, gnarly "aphis apples" so familiar to some growers. All three winter as black eggs, and they appear on the trees with the developing leaves. The rosy apple aphid is particularly likely to be injurious in fruiting orchards, while the green aphid frequently persists throughout the summer on young trees. There appears to be a fairly close relation between serious outbreaks of plant lice and cool, unseasonable weather during late spring and early summer. This is also borne out by the fact that aphid injury is more likely to be serious in the vicinity of the Great Lakes than in places remote from the water, where higher temperatures commonly prevail.

Extended experiments, conducted under the direction of Professor Parrott of the Geneva Station, have shown that these pests are most easily controlled by early spraying, namely, just after the buds have burst and before the leaves have developed to any extent. A good contact insecticide is all that is necessary, provided the application is timely and thorough. One of the best preparations is a nicotine extract, 40 per cent, used at the rate of three-fourths of a pint to 100 gallons of water to which from six to eight pounds of a cheap soap (preferably whale-oil soap) is added to serve as a spreader. The tobacco extract may be added directly to the lime-sulphur wash when used either as a late dormant spray or in a more dilute fungicidal solution, in which event soap is undesirable. Frequent infestations by aphids would be sufficient justification for delaying the spraying for San José scale mentioned above and adding the nicotine in an effort to control both insects with one treatment. A serious aphid infestation may justify special applications later in the season.

CODLING MOTH

The codling moth, *Carpocapsa pomonella* Linn., is the parent of the common apple worm, a pest that may infest and thus seriously damage from one-fourth to one-half or more of the crop, much depending on local conditions.



FIG. 233.—SIDE-WORMY APPLES SHOWING THE IRREGULAR HOLES FILLED WITH BROWN BORINGS

The apple worm winters in a tough, silken cocoon usually located in an oval cell under the rough bark of trees. The caterpillars transform to brown, apparently lifeless pupae in late April and early May, and the moths begin to emerge and continue to appear throughout the greater part of June. The minute, whitish eggs are deposited largely on the leaves, although under certain conditions they may be found more abundant on the young fruit. The eggs hatch in about a week, and consequently worms of the first brood may be entering the fruit from early in June, approximately three weeks after the blossoms fall, until the end of the month, or even later. Some of the young caterpillars gnaw a small hole in the side of the fruit, excavate a circular gallery with a radius of approximately one-eighth inch, and then desert this cavity and make a second entrance at the blossom end. This appears most likely to occur in the western part of the state during late June and early July, and is there generally known as "side worm" injury. The caterpillars require about four weeks to complete their growth, at which time they desert the fruit, wander to a sheltered place, spin a cocoon, and transform to pupae. In about two weeks, namely the last of July or in August, another brood of moths may appear. These in turn deposit eggs that hatch in due time, and the young larvæ enter the side of the fruit, particularly wherever two apples touch or a leaf hangs against an apple, as well as in the blossom end.

Experiments, not only in this state but in others as well, have shown that approximately three-fourths of all the wormy apples are entered at the blossom end; furthermore, that by far the best results in control work are obtained by spraying with a poison (three pounds of paste arsenate of lead to fifty gallons of water) as soon as is practical after the dropping of the blossoms and before the green calyx lobes have closed and thus made it impossible to get poison into the calyx cup. Experiments in New York State have shown that under good orchard conditions, with fair and thorough commercial spraying, from 95 to 98 per cent of worm-free fruit can be obtained with the above-mentioned treatment. This indicates the importance of making the application at the time indicated if the best results are to be secured, particularly since it is also known that a second application three weeks after



FIG. 235.—SIDE WORMY APPLES IN SECTION, SHOWING THE CHARACTERISTIC METHOD OF EATING

blossoming is only about one-half as effective. There is a possibility, in localities where side worm injury is particularly prevalent during early July, that a spraying the latter part of June will prove helpful. A spraying the latter part of July is frequently given for the special purpose of checking the second brood, although in this state experimental data do not indicate a very high percentage of gain from this practice; where fungous dis-



FIG. 234.—SIDE INJURY, SHOWING SMALL CIRCULAR SPOTS WITH CENTRAL HOLE, PRODUCED BY YOUNG CATERpillARS FROM LATE-DEPOSITED EGGS OF THE FIRST BROOD

eases require spraying, as intimated above, it is by all means advisable to add the poison and thus secure additional protection at a very slight increase in cost.

In sections where side worm injury is prevalent, annual spraying, whether the trees be fruited or not, is a most promising method of controlling this type of injury.

RED BUGS

The lined red bug, *Lygidea mendax* Reut., and the true red bug, *Heterocordylus malinus* Reut., have recently attracted much

attention because of the serious injuries occurring to young fruit, in some instances nearly half the set in an orchard being destroyed.

The earlier signs of injury are found in the indistinct, reddish brown spotting of the more tender opening or recently unfolded leaves. As the foliage ages, the discoloration becomes darker, and after a time the central portion of the more seriously affected tissues may die and drop, leaving an irregular series of reddish-brown-margined holes in the somewhat curled, crumpled leaves. At first affected apples show a slight exudation accompanied by a local discoloration and hardening. The young fruit is frequently pierced to the core and, as growth continues, depressions with pithy centers extending deep into the tissues may be formed.

Both species winter as eggs deposited in the smaller twigs, those of the true red bug hatching just before the blossoms open, and those of the lined red bug about a week later. The young bugs remain at first among the tender developing leaves, and as they increase in size begin to attack the developing fruit, producing the effects described above.

Experimental and practical work have shown that young red bugs can be destroyed with a nicotine preparation, like that recommended for plant lice. In case the pests are numerous there should be a spraying just before the blossoms open. In some instances this may be combined with a very late spray for San José scale, and then nicotine should be added to the first treatment for the codling moth and particular pains taken to spray as early as possible after the dropping of the blossoms, in order to destroy the insects before they have increased much in size.

EARLY LEAF FEEDERS

A number of insects may be grouped under this head, namely, the apple tent caterpillar, the cankerworms, the bud moth, the case-bearers, the leaf roller, and the green fruit worm, since all of these begin feeding early on the young leaves.

The apple tent caterpillar and the looping cankerworms are so well known as to require no description. The bud moth, *Tmetocera ocellana* Schiff., is only about half an inch long when full grown, is dark brown in color, and has a darker head. It is usually found in a webbed retreat among partly opened leaves or

developing blossoms. The two case-bearers are easily recognized by the characteristic cases, that of the cigar case-bearer, *Coleophora fletcherella* Fern., being cigar-shaped, while the pistol case-bearer, *C. malivorella* Riley, is enclosed in a pistol-shaped shelter. Both remain exposed on the leaves and although small, being less than a quarter of an inch long, are easily seen. The leaf roller, *Archips argyrospila* Walk., is about three-fourths of an inch long, active, light green, with a dark brown or black head, and may



FIG. 236.—APPLES SERIOUSLY INJURED BY THE GREEN FRUIT WORM

be found in loosely curled leaves as well as eating into the fruit. The green fruit worm, *Xylina antennata* Walk., is larger and stouter, has a light green head, and is usually marked with several distinct, although somewhat broken, longitudinal white lines.

When any of these are abundant they should be checked by early and thorough applications of a poison, such as arsenate of lead, about three pounds of the paste to fifty gallons of water being used. In many instances the first spraying for the codling



FIG. 237.—WORK OF ROUND-HEADED APPLE TREE BORER AT BASE OF YOUNG TREE

moth is sufficient to hold the other pests in check; but, when such is not the case and it is necessary to spray for San José scale, the treatment may well be delayed until the leaves have started from the buds, when poison can be added to the dormant spray in order to destroy the leaf feeders while they are still young. Satisfactory results have not always been obtained when spraying with a poison for the control of the leaf roller. In orchards where the pests are likely to be numerous, thorough spraying with a miscible oil diluted one to fifteen has been advised by Professor Herrick for the destruction of the egg masses, the application to be made just before the buds open.

BORERS

Young trees, in particular, are likely to suffer from attacks by the common round-headed apple tree borer, *Saperda candida* Fabr., a white, legless grub that displays a marked preference for the base of the trunk and is usually found at, or a little below, the surface of the soil. The parent beetle is about three-fourths of an inch long, and is a rich brown in color with broad, creamy white, longitudinal stripes. The shy, retiring beetles appear in midsummer but are seldom seen. Systematic examination of young trees in both spring and fall, and the digging out of the borers by the judicious use of a knife and a hooked wire, prove the most practical methods of controlling this pest.

Sickly apple trees are sometimes badly infested and occasionally destroyed by the fruit-tree bark beetle, *Eccoptogaster rugulosus* Ratz., a small, shining, dark brown, or nearly black bark beetle that enters the affected wood through small holes in the bark and produces the familiar "shot-hole" appearance. This insect confines its attacks very largely to sickly and dying trees. Incidentally it is a more serious enemy of peach, plum, and pear. There may be two broods or generations in a season, and the most obvious method of control is to cut out and burn all sickly or infested wood. Trimmings from any trees liable to infestation should not be allowed to remain in the vicinity of the orchard, since brush piles occasionally become breeding centers and result in injury to nearby trees.

SOME OF OUR MOST COMMON APPLE DISEASES

H. H. WHETZEL

Professor of Plant Pathology, Cornell University, Ithaca, N. Y.

and

LEX R. HESLER

Assistant Professor of Plant Pathology, Cornell University, Ithaca, N. Y.

APPLE SCAB



The scab disease of apples, which is caused by the fungus, *Venturia inaequalis*, is by far the most common and destructive disease of this fruit in New York State. The nature of the losses incurred explains in a large degree why the trouble is so serious. Ordinarily the reduction in quality of the fruit due to this disease is considered to be the main source of the loss. While this is important, it constitutes only one of the several factors involved.

In some years, as for example in 1910, early scab infection, when not controlled, almost wholly prevents the setting of fruit. On the other hand, where a fine set of fruit occurs, the apples are liable to infections during all stages of development. In case a single lesion appears on a young apple, its growth on the affected side is retarded and there results an unsymmetrical fruit. Frequently fifty to seventy-five per cent of the apples are scabby, which means little or no returns for such fruit at picking time. Fruit thus affected does not keep so well in storage, the scab spots furnishing an easy entrance for storage-rot organisms, such as the pink-rot fungus.

In addition to the immediate effect on the crop of the current year there is, in case of severe leaf infection, a devitalizing effect on the tree. Reliable figures on losses from this disease are very difficult to obtain. Such figures are to be obtained only by estimates based upon increased profits from sprayed orchards. Since such returns almost invariably include not only saving from scab,

but also from codling moth, it is not possible to separate the two very satisfactorily. It has been conservatively estimated that the state of New York alone loses over \$3,000,000 annually through failure to spray for these destructive pests.

It is rather generally understood by growers as well as by scientists that the apple scab is caused by a fungus. This minute organism spends the winter in the old fallen leaves as partially developed fruiting bodies called *perithecia*. Under favorable conditions in the spring, these perithecia forcibly discharge their spores (*ascospores*) into the air. These spores are very light and are carried by slight air currents to the openings buds. This process of ascospore discharge continues for a period of approximately one month, beginning about the time the blossoms are ready to open, provided (1) that conditions have been right for the maturation of the ascospores, and (2) that there is rain enough to furnish the necessary moisture for the discharge after these spores are ripe.

The first activities of the ascospores take place on the opening leaves. As they expand from the blossom bud, their lower surfaces are first to be exposed to the spores from the old leaves on the ground. Hence it may be seen why the lower sides of leaves surrounding the buds are first to show signs of the disease. As long as the leaves are on the tree the growth is very superficial, the fungus living in the outermost portions of them. Within a short time after the spore alights on a leaf, it germinates and penetration is effected. Soon there appears the characteristic brownish olivaceous growth of the parasite, which worms spots with indefinite, fringed margins. Later, summer spores are developed on the leaves and are blown to other leaves, infecting both the upper and lower surfaces. In time the apples have developed, and the summer spores (*conidia*) may infect them. Not only do the conidia infect young fruit, but the ascospores from the old leaves may continue to infect the apples, even after they are well set. The fruit pedicels may also be infected, resulting in a general failure to set fruit.

The scab spots are most familiar on the fruit, where they are very much the same in size, shape, and color as they are on the upper leaf surface, although perhaps more sharply defined. They



FIG. 238.—A CLUSTER OF HALF-GROWN APPLES BADLY SCABBED

are usually numerous about the blossom end of the fruit. The spots show a whitish, papery margin and a velvety brown center. As they grow older the velvety center disappears, exposing a brown corky layer beneath. This frequently cracks and checks. Later infections — that is, those appearing about picking time or after the fruit is stored — are very different in appearance from the early infections; they are much smaller, being mere black specks.

In the autumn the leaves fall to the ground, taking the fungus with them. There it changes from its superficial habit to one involving the whole leaf. The winter fruiting bodies (the *perithecia*) are soon developed, in which condition the fungus again lives until spring.

Influence of the Weather on the Disease

It is clearly understood, then, that the scab is a fungous disease, and is not caused by weather conditions. To be sure, the weather is the most important environmental factor influencing the disease, but unless the fungus is present there will be no scab. The weather influences the disease by affecting both the fungus and the apple tree. If rain falls just before the blossoms open, the mature ascospores are discharged and infection results on young leaves and pedicels. If the ascospores are not discharged by the rains until just after the blossoms open, infection of the developing fruits occurs.

If these first infections do not occur within a month after the blossoms begin to open, it is likely that infections will be few and unimportant during the season.

Controlling the Disease

In controlling scab the following points should be taken into consideration: (1) the fungus winters over in the old leaves on the ground; (2) the spores therefrom are discharged at about blossoming time during a period of a month, rain being necessary to this discharge; (3) the opening leaves and fruit stalks are first liable to infection, and later other leaves and growing fruits are subject to it. Plowing under the old leaves which harbor the fungus would seem advisable. This has been frequently recom-

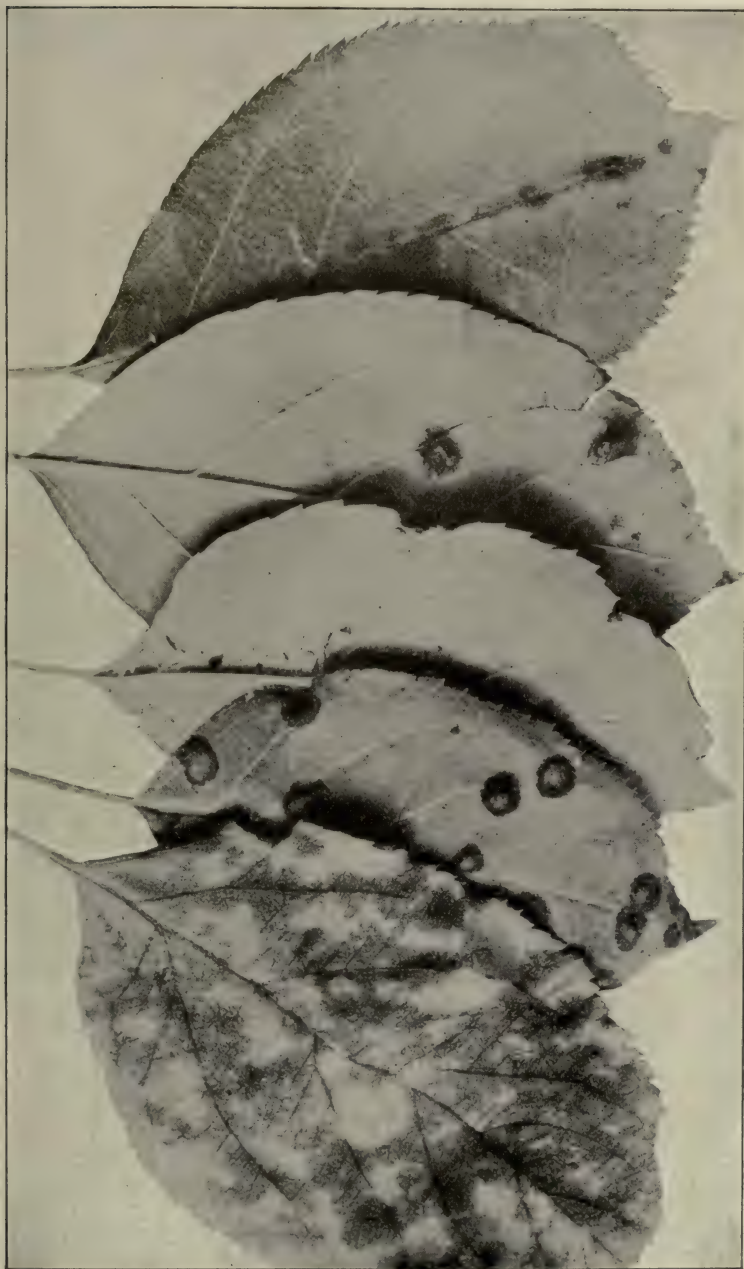


FIG. 239.—SCAB SPOTS ON APPLE LEAVES, SHOWING UPPER AND LOWER SURFACES

mended, and the practice of plowing orchards is commendable; but this operation alone is not to be depended upon as a measure for the control of apple scab. Spraying the susceptible parts before the spores fall upon them is the common and very effective practice. The spraying must be done before the rains and not after, since moisture conditions the discharge and germination of spores causing the trouble.

Bordeaux and lime-sulphur are used in this state, the latter being more extensively employed; bordeaux, as is well known, severely russets certain standard varieties, particularly in wet seasons, and hence is objectionable. Lime-sulphur, testing 32 degrees Baume at a 1-40 strength, is to be regarded as a safe and sure fungicide.

Make the first application just before the blossoms open, but after the individual blossoms have separated. The grower should allow a period of only two or three days in which to administer this application. This spraying protects the fruit stalks and hence prevents a loss of the set of fruit. Apply the same fungicide later, beginning when about two-thirds of the blossoms have fallen. This application protects the young fruits and gives a clean crop. A third application is necessary only when the season is rainy; this is made about ten days or two weeks after the second application, depending upon the rain periods. Likewise, a fourth spraying is frequently essential the latter part of July or the first of August, the grower to be guided by the weather conditions. The crop of fruit may be clean up to this time of year; then, should the application be omitted, especially if the leaves show some scab in the spring, the fruit may become severely infected and the result be a heavy and an unnecessary loss.

In spraying, a high pressure of 150 to 200 pounds should be maintained. A fine, driving mist should be sought; therefore, select the nozzle accordingly. If the grower sprays thoroughly and at the right time, he should expect to obtain 95 per cent clean fruit under the most trying conditions. It may well be repeated that all applications should be made just before and not just after rain periods. Recent investigations in this state indicate that dusting with finely ground sulphur may soon supersede

spraying in the control of apple scab. A mixture of eighty or ninety parts sulphur to ten or twenty parts powdered lead is to be regarded as most effective. Applications are to be made at the same time as recommended for spraying.

BLACK ROT, LEAF SPOT AND CANKER OF THE APPLE



FIG. 240.—BLACK ROT CANKER ON APPLE LIMB. NOTICE THE PIMPLE-LIKE FRUIT BODIES COVERING THE CANKERED SURFACE

This disease which is caused by the fungus *Physalospora cydoniae*, is perhaps best known to New York farmers under the name "New York apple-tree canker." The above designation is assigned and used to represent more nearly the nature of the trouble in its attacks on the various parts of the apple. The fungus not only produces on the limbs a serious canker, but it also affects the fruit, inducing a black rot, and attacks the foliage, producing a leaf spot. These three forms of the trouble are not everywhere equally troublesome; in this state the limb injury is the most familiar and also the most dangerous type of this disease. Prominent growers and scientists concur in the opinion that the New York apple tree canker is, in certain parts of the state at least, second in economic importance only to the apple scab.

As previously stated, the canker is caused by a fungus. It may live about the orchard on dead twigs in the brush pile, or it may feed on the dead parts of a great variety of wild and cultivated trees and shrubs. The spores of the fungus may be present for a time on the healthy bark and may even prepare to enter the bark, but actual penetration is never accomplished until an injury of some sort is afforded. The fungus does not seem to have preference in this respect, for it follows frost injury, fire blight, apple

rust, insect punctures, bruises made by the orchardist, and so on. Once the organism is assisted in its entrance, the effects of its work are soon evident. On the bark, the first signs of the disease consist of a slight brown area, which slowly becomes darker and more extended, the spot taking on an oval shape, the longer diameter being parallel to that of the main axis of the cankered limb. Very soon the surface is depressed and the margin shows a crevice; before many weeks the infected area exhibits a great many small dome-shaped fruiting bodies of the pathogene, which are known as *pycnidia*, and contain the spores of the fungus. Under proper conditions of moisture these spores ooze out of the *pycnidia* and are washed to the leaves and fruits below, resulting in the production of leaf spot and black rot. These forms of the disease, however, are of relatively little importance in New York State.

The fungus in the above described condition passes the winter in these cankers. In the spring the fungus usually starts its activities again by its spread at the margin of the old canker and by the dissemination of its spores. The fungus in some of the cankers dies out at the end of the year; in others it spreads for several years in succession, there being produced eventually a large canker sometimes several feet in length.

Control

In the control of this disease there are several things to be borne in mind: (1) The fungus cannot be eradicated by the use of sprays; its vegetative parts are buried in the host tissues and are not reached by any known fungicide. (2) The prevention of wounds and the protection of injured surfaces by means of fungicides are logical measures to practice. (3) Cankers furnish a hibernating place for the fungus, and dead wood may also hold the parasite for several months.

With these points as a basis, the following means of control are to be followed: Remove cankers from the larger and more valuable limbs, wherever it seems desirable and profitable to save such limbs. Cut out all diseased parts, bark or wood, pointing the upper and lower ends of the cut and making the edge of the wound perpendicular to the surface, and dress the wound with coal-tar. In

those cases where small or less valuable limbs are affected, they may be cut off below the canker and very close to the parent branch. This procedure also applies to cases where affected limbs are nearly or wholly girdled.

The recommendation that the grower should plant resistant varieties to avoid cankers offers no immediate relief. In arranging for future plantings, however, it should be remembered that in New York State the Twenty Ounce is notably susceptible. This variety, above all others, suffers uniformly from the effects of the New York apple-tree canker. This does not mean, however, that it is impossible to grow this variety successfully, but wherever it is grown its protection from this disease becomes a matter which is burdensome, even to the most vigilant apple grower.

STIPPIN, OR BITTER PIT

The cause of this disease is not fully understood. It is called stippin, bitter pit, black rot, or Baldwin spot, and so far as known, affects only the fruit.

Some varieties show the trouble more commonly than others. In this region, for example, the Baldwin is most subject, and it is the belief of many orchardists that only this variety is affected. But, as a matter of fact, the spots occur frequently on the Northern Spy, the Rhode Island, the Tompkins King, and less commonly on some other kinds. It is worthy of mention that a given variety may suffer considerably in one locality, and may be free from the disease in another region. It is of interest, too, that the individuals of a variety show wide differences in the amount of the trouble. For example, the apples on one side, or even on one limb of a single tree will show stippin, whereas fruits on the other side or on another limb remain unaffected. This resistance of a group of individuals belonging to a susceptible variety is one of the peculiar and interesting characteristics of the malady.

The disease is known the world over and occurs under certain conditions in practically all of the more important apple-growing districts of the various countries. New York appears to be no exception; apples in this state are highly subject to the trouble,

and the losses thus incurred are frequently of considerable moment. Not uncommonly from twenty-five to fifty per cent of a crop of the more susceptible kinds, such as the Baldwin, is either wholly lost or the fruit reduced to a condition of relatively small worth.

Bitter pit, or stippin, usually appears on the fruit at or near maturity. It is not primarily a storage disease. There are from a few to many spots in an apple, and these may be described as follows: The areas vary in size from mere dots to one-eighth of an inch or more in diameter; they are roundish in outline; color



FIG. 241.—APPLE SHOWING CHARACTERISTIC STIPPIN OR BITTER PIT SPOTS

pale to dark green, or ruddy brown. On the Baldwin the spots are a darker red than the surrounding healthy tissue. The affected areas are sunken and the flesh often tastes bitter, hence the name bitter pit. Usually the spots are most numerous near the blossom end. Their general appearance is not unlike that of hail-mark, but the skin is not broken in any way. The disease is not infrequently mistaken by growers for the spotting caused by San José scale.

If the fruit be cut open, the flesh under the pit is found to be dead, brown, dry and spongy, and extending in toward the core for only a short distance. Scattered throughout the flesh are brown spots, which have no direct connection with the surface spots.

As previously noted, the cause of this peculiar trouble is not fully understood. It has been satisfactorily demonstrated, however, that stippin is not a mechanical injury, nor is it due to the action of any bacteria, fungi or insects. The common opinion of those who have investigated the disease more carefully is that the injury results from abnormal distribution of water through the fruit. As to the nature of this abnormal distribution, authorities are not wholly agreed. Therefore, the main theories as to the manner in which poor distribution of water may bring about the disease should be noted; there are four:

1. The injury results from an extremely rapid transpiration or loss of water from the cells, thus bringing about a concentration of the sap and the killing of those cells nearest the sap tubes.

2. The spots result from the death of groups of cells because dryness of the soil early in the growing season prevents the transportation of mineral matter (food) to these cells; hence they starve and die.

3. The injury occurs under such conditions as prevail when the transpiration of the apple is rapid during dry warm days, and the process of evaporation is suddenly stopped during cool nights. Under such conditions, the roots in the warm soil continue to force water into the cells of the fruit at night. Hence, cells near the source of the supply, becoming gorged and distended, finally burst and die. Adjacent cells, being deprived of their water supply from such cells, also die.

4. The brown spots result from a death of cells due to a deficiency in the water supply. This deficiency in a wet season results for the reason that the apple grows very rapidly and the conductive system of the apple is not able to supply the new growth; hence the water is deficient. In a dry season, the transpiration (evaporation) is excessive, and, as the soil lacks moisture, it cannot supply a sufficient amount of water, again resulting in a deficiency.



FIG. 242.—EUROPEAN CANKER, OFTEN FOUND IN NEW YORK STATE. NOTE CALLUS RIDGES

Little is being done by pathologists or growers in this state toward the control of the disease. In the light of the above theories, all of which agree that the trouble is a result of some irregularity in the water supply, it appears that any operations which will tend to make uniform the water relations of the soil and of the plant will aid in reducing the disease. Some points worthy of note in this connection are soil drainage, proper tillage, and cover cropping at the proper season. It is also advised that pruning and thinning be not overdone. Wherever the trouble occurs periodically in storage, it is recommended that the store-room be not too dry and that the temperature be kept at about 30 to 32 degrees Fahrenheit.

EUROPEAN APPLE-TREE CANKER

This canker is caused by the fungus *Nectria galligena*. In the younger stages it is not easily recognized as distinct from any other canker. As new callus is developed around the margin of the wound, it is attacked and killed by the fungus; the latter spreads for a short distance, where another layer of new growth, or callus, is formed. This process is repeated until a series of ridges or rolls of callus may be developed, giving the appearance so characteristic of this disease in its later stages. The trouble seems to be on the increase in New York. For its control it seems reasonable to conclude that the measures advised in the case of the New York apple tree canker are applicable. (See Black Rot, Leaf Spot, and Canker of Apple, page 861.)

ILLINOIS BLISTER CANCER

This disease is caused by the fungus *Nummularia discreta*. The blister canker is chiefly a disease of apple orchards of Indiana, Illinois, and neighboring states, although it is now present in this state. It is usually found on the larger limbs and the trunks, affecting the bark and wood. The diseased bark is at first brown and slightly sunken, showing healthy bits of tissues scattered within the generally diseased area. In a later stage the bark becomes much roughened and blackened, and falls off in irregular patches, exposing the wood. On the dead areas, or even on the bark before it falls away, the fruiting parts of the fungus are developed. These bodies are relatively large and black, and therefore



FIG. 243.—ILLINOIS APPLE-TREE CANKER. NOTE DISC-SHAPED FRUITING BODIES OF FUNGUS IN DEAD BARK

stand out prominently, giving a blistered appearance to the canker, whence the name. A satisfactory control method is unknown.

SOOTY BLOTCH

This disease, which is caused by the fungus *Leptothyrium pomi*, is so named because of the appearance of the spots on the fruit. The blotches are rather irregular in outline, sooty in aspect, and



FIG. 244.—SOOTY BLOTCH

superficial in nature. The blotched appearance is due to the presence of the fungus, the vegetative parts of which grow on the surface of the skin of the apple. These vegetative parts are composed of a network of radiating olive-brown threads. Apparently no spores are produced to be scattered throughout the summer as, for example, in the case of the apple scab fungus.

Another form of the trouble is found in what is known as “fly

speck," the name describing the disease. These troubles are more common in wet seasons, and during the season just past the sooty blotch has been very prevalent in New York State. The fruit is not destroyed nor rotted in any way, although there is no doubt that the presence of the fungus on the surface mars the appear-



FIG. 245.—FLYSPECK TYPE OF SOOTY BLOTCH

ance of the fruit and so depreciates its value. It should be controlled to a large degree by the later scab spraying described above for wet seasons.

FIRE BLIGHT

This is a bacterial disease caused by *Bacillus amylovorus*. See article by M. F. Barrus on Pear Diseases, Part II of this bulletin. The fact as to cause and control therein set forth apply equally to this disease as it manifests itself on the apple, especially on young trees.

DWARF APPLES

U. P. HEDRICK

Horticulturist, New York Agriculture Experiment Station, Geneva, N. Y.

Especial interest in dwarf apples at the New York Agricultural Experiment Station began in 1901, when the State Fruit Growers' Association, The Eastern New York Horticultural Society, and the Western New York Horticultural Society appointed committees to confer with the authorities at the Station for the purpose of locating experimental orchards of dwarf apples. At that time the country was in one of the periodic revivals of interest in dwarf fruits that have several times held sway in eastern America. But there was a well-defined motive behind the movement that led the horticultural societies of New York and this Station to cooperate in the planting of dwarf apples.

San José scale had come in the state and was rapidly spreading. It was thought that the scale could best be controlled by fumigating the trees under tents. Since it was certain that dwarf trees could be easily fumigated, fruit growers asked for an experiment in order to determine whether dwarf apples could be grown profitably in commercial orchards. Had it not been for this apprehension of grievous disaster from San José scale, it is doubtful whether the fruit growers would have called for the investigation, or whether the Station would have voluntarily undertaken it.

DWARF TREES

Dwarf trees are plants that by various means are made to grow smaller than normal specimens of the same species or variety; for example, by growing on stocks that dwarf the top, by restricting the root run, and by pruning to check or suppress the top. Horticulturally speaking, dwarf trees are those grown on dwarfing stocks. In this connection it may be remarked that tree-like forms usually succeed very well on bushes or smaller growing plants of the same species, or often of closely related species. The cases are few, however, where varieties or species of small stature can be profitably grafted on plants of larger size. Unfortunately, there are no known relationships of plants that serve as accurate guides in the matter of grafting.

STANDARD STOCKS

What we in America call standard stocks are seedlings of the common apple, *Pyrus malus*. There is a mistaken notion that these stocks come from seeds of *Pyrus baccata*, or hybrids of it, which constitute our crab apples. It is doubtful whether true crab seeds are often, if ever, planted for standard stocks. Until recent years, all, or nearly all, standard stocks for this country were imported from France and Belgium under the name "French Crab," with the implication, too often given credence by nurserymen, that they were seedlings of true crabs.

There are at least two kinds of standard stocks: those grown from seeds of wild apples and seedlings of cultivated varieties. Were choice possible, there should be no hesitation on the part of fruit growers to take seedlings from wild trees. It is difficult, however, to obtain seeds from wild trees, and most of the apple stocks now used by nurserymen come from seeds taken from cider mills. Since all cultivated varieties of apples may go to the cider mill, the resulting seedlings cannot fail to be variable, giving good, bad, and indifferent stocks.

DWARFING STOCKS

Apples are dwarfed by grafting or budding them on small-growing forms of the cultivated species of this fruit. What are these species? Scarcely any two botanists who have studied the apple agree. Accepting the best authority, we must look on dwarfing stocks as diminutive forms of the species from which come most of our cultivated apples.

Watching seedling apples, one finds that the variation in the size of the plants coming from miscellaneous seeds is considerable. Unquestionably careful selection of the most dwarfed forms of seedling trees would give us dwarfing stocks similar to those now in common use. Unquestionably, too, the dwarf or unproductive or scraggly-growing trees of this or that variety to be found in many orchards owe these qualities to the stock and not to the scion. There are, possibly, a score of named seedling stocks, but of these we are concerned in this experiment with but two, French Paradise and Doucin.



FIG. 246.—VAN ALSTYNE ORCHARD: MANNER OF PRUNING AT TRANSPLANTING

French Paradise

This is probably the most dwarfed of the several stocks and has the reputation, ungrafted, of being the most precocious in bearing as it is also in season of blooming and fruiting. Grown to maturity, this apple is described as being dwarf, compact in habit, productive and as bearing very good, early autumn, dessert apples, golden-yellow in color with a reddish blush, and of a brisk, agreeable, acid flavor. Independent of its value as a dwarfing stock it is said to be a useful orchard or garden plant. The derivation of the name is obvious, the forbidden fruit of which Adam and Eve ate.

Doucin

The Doucin is a French stock, which roots and grows more freely than does the French Paradise, the root system differing greatly in having more woody roots that strike downward to a greater depth. When permitted to bear fruit, the apples of Doucin are a greenish yellow with a decided blush and are sweet, the flavor giving the name from the French "douceur" — sweetness.

Propagation of Dwarfing Stocks

Some of the dwarfing stocks sucker so freely that the readiest means of propagation is to detach the sucker and use it as a stock. Other dwarfing stocks are propagated from root cuttings. But unquestionably the chief method of propagation is by mound-layering. Well-established plants are made to stool by cutting them off a few inches from the ground. When these stools have made sufficient growth, usually in the summer of the second season, their bases are buried in a mound, and by fall a rooted plant will have formed. These, if sufficiently vigorous, may be grafted the following winter or budded the next summer. The small stocks in a stool are grown in the nursery row for an additional year.

DISCUSSION OF EXPERIMENTS

Three sites were chosen for experiments: one at Kinderhook, Columbia County, in the Hudson Valley, on the farm of Edward van Alstyne; another at Fayetville, Onondaga County, on the farm of F. E. Dawley; and the third at Carlton, Orleans County,



PLATE 247.—TREE ON DOUCIN STOCK BEFORE AND AFTER PRUNING

on the farm of Albert Wood and son. The distribution of orchards in eastern, central, and western New York gives rather distinct climatic and soil conditions for the three orchards.

Plan of the Tests

Briefly stated, the general plan of the three experiments was to grow a permanent orchard of standard trees with fillers of varieties on Doucin stock, and between these fillers on Paradise stock. The distance between the trees in the Wood orchard is fifteen feet; in the other two, twelve feet.

The van Alstyne orchard was planted in the autumn of 1904 with 306 trees on the three stocks as follows: standard trees, 27; on Doucin stock, 153 trees; on Paradise, 126. These were distributed among the following varieties: Baldwin, Boiken, Holland Pippin, Hubbardston, Jonathan, Lady, McIntosh, R. I. Greening, Rome, Sutton, Wealthy, and Wagener.

The Dawley orchard was planted in 1904 with 512 trees, the number on each stock being: standard, 42; Doucin, 161; Paradise, 309. The following are the varieties: Alexander, Baldwin, Boiken, Esopus, Gravenstein, Green Sweet, Grimes, Hubbardston, Jacob Sweet, Jonathan, Longfield, McIntosh, Monmouth, Northern Spy, Pumpkin Sweet, R. I. Greening, Rome, Sutton, Wagener, Wealthy, Wolf River, Yellow Transparent.

In the Wood orchard there were originally 375 trees set in the autumn of 1903: 45 on standard, 110 on Doucin, and 220 on Paradise stocks, distributed among the varieties Alexander, Baldwin, Ben Davis, Boiken, Gravenstein, Holland Winter, Jonathan, Lady, McIntosh, Monmouth, R. I. Greening, Rome, Sutton, Bismarck, Twenty Ounce, and Wealthy.

Care of the Orchards

The three orchards received the care commonly given commercial orchards in New York except in particulars to be mentioned.

Scion Roots and Suckers. Beginning with the first year it was found necessary to go over the orchards each spring and cut such roots as had sprung from the scion and such suckers as had come from the stocks. This was no small task, the first operation requiring that more or less earth be removed and replaced, although

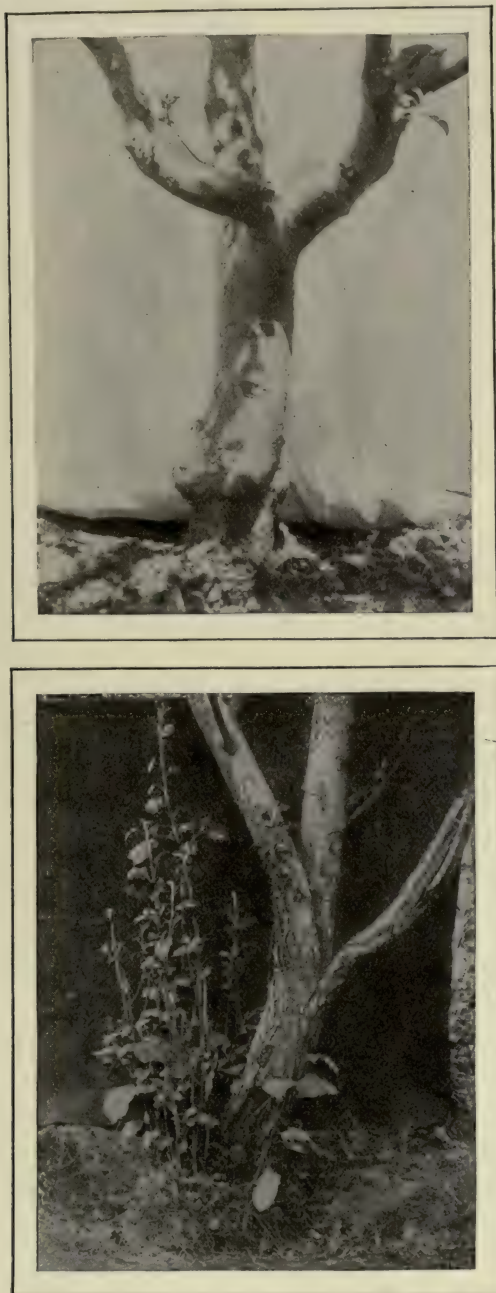


FIG. 248.— DEFECTS OF TREES ON DOUCIN STOCK; UPPER, PROTUBERANCE ABOVE UNION; LOWER, SUCKERING HABIT

it may be said that the trees should not have been set so deep as to make this necessary. Shallow planting was tried in the Dawley and van Alstyne orchards but with disastrous results to the surface-rooting Doucin and Paradise trees, many of which were blown over with even moderate winds while others suffered from sun, plow, and cultivation. It was found necessary to hill up these shallow-rooted trees by plowing toward the rows.

Pruning. The winter pruning of the trees, although more difficult than in training standard trees, gave comparatively little trouble. It consisted of cutting out crossed branches, surplus branches, and such few, of course, as were injured or diseased. It was necessary to head back the wood on the Paradise and Doucin trees more severely, depending on the variety, than that on the standards, but otherwise the pruning was much the same on all.

For the first two seasons but little summer pruning was attempted, the trees being small and none too vigorous. Then began a series of experiments, no one of which proved satisfactory.

Measuring the Results

In the light of ten seasons' work with dwarf apples, suffice it to say that the training of the plants is the most difficult and the least satisfactory operation in growing these trees. Indeed, it is hardly too much to assert that if dwarf apples must be headed back or pinched in during the growing season, it is impossible to grow them in the trying climate of New York. In no one of the attempts at summer pruning have we been able wholly to avoid weak, spindling second growths which would not mature and succumbed to the cold of the next winter.

The Union of Stocks and Scions. The value of a stock is greatly reduced if the union between the consorting parts of the tree is poor. There is no question but that varieties unite unequally well with different stocks. The following figures show with which stock apples irrespective of variety unite best: 31 trees on Paradise are reported to have broken off at the union during the ten years' test; four on Doucin; none on French Crab. There were, too, a considerable number of trees in which there were enlargements above the union as shown in the upper half of Fig. 248.



FIG. 249.—ROOT SYSTEMS OF APPLE TREES: LEFT, BUDDED STANDARD; SECOND, GRAFTED STANDARD; THIRD, PARADISE; RIGHT, DOUCIN

These, however, seem to affect the vigor of the tree little or not at all. In this test there were no enlargements on standard trees although they may occasionally be seen in orchards of standards. The number of these deformities on the two dwarfing stocks seems to be about the same, although it is impossible to give the exact number since one can hardly say when an enlargement at the union becomes abnormal. These figures seem to indicate that the union between stock and scion is poorest on the Paradise, next so on Doucin, and best on the standard.

Winter Injury. The following figures, grouped for the three orchards and roughly given, indicate the relative hardiness of the three stocks: Of the 600 trees on French Paradise, 57, or 9.5 per cent, are marked as having died of winter injury; of the 404 Doucins, 18, or 4.45 per cent, were winterkilled; on the French Crab only three, or 2.75 per cent, succumbed to cold.

That the dwarfing stocks are less hardy than the French Crab occasions little surprise when one remembers that their roots are much nearer the surface of the ground. The French Paradise is reported everywhere in Europe to be tender to cold, and it is to be expected that it would be less hardy in the trying climate of New York than either of the other two stocks. Undoubtedly the injury from winterkilling was more severe during the first and second seasons because the trees had been planted in the autumn. From the experience with fall planting in these three orchards, it may be laid down as a rule that dwarf trees should not be planted in the autumn in a climate as cold as that of New York.

Surface Rooting. The greatest weakness of dwarfing stocks for New York orchard conditions is the surface-rooting habit of both Doucin and Paradise. In this respect the two stocks cannot be distinguished — the roots of one being as near the surface as those of the other. In Fig. 249 is shown the rooting habit of the three stocks. Several evils follow surface rooting. The dwarf trees suffered most from winter injury — no doubt in part because of the nearness of the roots to the surface. About ten per cent of the dwarf trees in the three orchards sooner or later either blew over or their roots were so exposed that the trees had to be reset or replaced. In Fig. 250 is shown a tree on Paradise blown over the last year of the experiment. Undoubtedly, too,



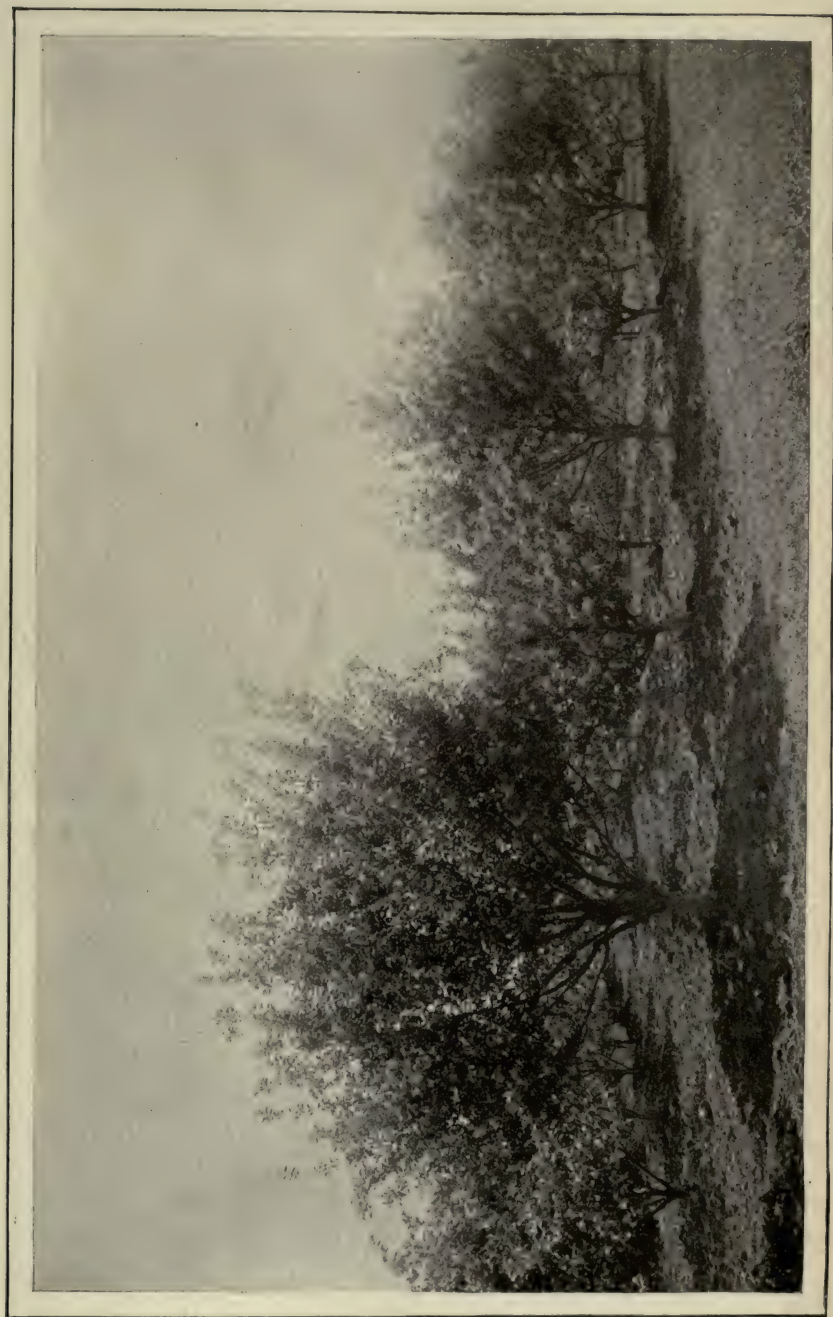
FIG. 250.—WAGENER APPLE TREES ON PARADISE STOCK BLOWN OVER, TEN YEARS FROM SETTING

some of the trees that refused to thrive did so because of the exposed condition of their roots, while in a damper climate, in sod, or under a mulch system, surface rooting might not prove so disastrous.

This experiment all but demonstrates that dwarf apples can not be successfully grown under the high cultivation methods of New York. It may be asked why the trees were not set deeper. The answer is that if the trees be set sufficiently deep so that the scion touches the ground, it strikes and the tree ceases to be a true dwarf. Many trees that pass for dwarfs are not dwarfs at all. They were set on dwarf stocks, but the scion has taken root and the tree has become a standard, or, more correctly, half standard and half dwarf.

Suckering. Suckers from both of the dwarfing stocks proved more or less troublesome. It would be difficult to say whether Doucin or Paradise suckered most, but the weight of evidence seems to be against the Doucin. Both stocks are readily propagated from layers and stolons, either roots or stems striking root freely. It would, then, be expected that suckers would appear more freely than on standard stocks which come from seed and can be grown vegetatively only with difficulty. Presumably, however, there would have been far fewer suckers to contend with in these orchards under a sod or a mulch system of cultivation, for certainly the unavoidable injury to the shallow roots of the dwarf trees by plow and cultivator would stimulate the formation of suckers. The lower half of Fig. 248 shows the suckering habit of the Doucin stock.

The Size of the Trees. What is the comparative size of varieties on the three stocks? Could the reader see the trees, eyesight would be much better than figures to show their size. Thus, the Paradise trees are dwarf because of a very short trunk, the diameter of which is often nearly that of a Doucin or standard; the shoots of Paradise spring up to an amazing height from a dwarf framework so that figures make the trees seem unduly high. So, too, the slendered and more straggling growth of the Doucin trees magnifies the height and spread of trees on this stock if figures be followed closely. The photograph reproduced in Fig. 251 gives a much better idea of the size and habit of the trees than would figures.



A glance at the photograph shows that both Paradise and Doucin trees must have far more room as the trees grow in New York than is commonly recommended for them by either European or American writers. The distances recommended for Paradise range from six to twelve feet and from eight to sixteen feet for Doucin. From experience with the trees in these experiments, however, we should say that in cultivated orchards, apples on Paradise should be planted from fifteen to eighteen feet apart; on Doucin, twenty to twenty-five feet, depending on soil and variety. This means that in this state where standards are set from forty to fifty feet apart, Paradise should be set one-third and Doucin one-half as far as standards. On poorer soils, in sod, and where heavy summer pruning can be practiced, lesser distances may suffice.

Yield of Fruit. The van Alstyne orchard was slow in coming in bearing, none of the trees yielding fruit until 1907, the third year from setting, when one apple was borne on a standard tree, and three on Doucin. In 1908, trees on all three stocks bore, but on no stock was there an average of an apple per tree; in 1909, 27 French Crab trees bore 28 apples; 135 Doucin, 246 fruits; and 100 trees on Paradise bore 175 specimens. In 1910, the crop was a failure and the few fruits were not counted. The first yield of fruit worth taking into account, then, was borne in 1911, when the trees were nine years from the bud and seven from setting. The yields per tree for 1911 and the three remaining years of the test are shown in Table 1.

TABLE I
YIELDS IN VAN ALSTYNE DWARF APPLE ORCHARD

Number of trees	Stock	YIELD PER TREE			
		1911	1912	1913	1914
		<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
27.....	Crab.....	13	18	37½	79⅔
135.....	Doucin.....	10	21½	23	79
100.....	Paradise.....	7	15	14	36

The Dawley orchard bore its first fruit in 1906 when there were 83 apples on 300 Paradise trees, 23 on 157 Doucin trees, and none on the 37 standards. In 1907, the Paradise trees bore 96 apples, the Doucins 13, and standards none. In 1908, there were 567 apples on Paradise, 224 on the Doucin, and seven on the standard trees. In 1909, the Paradise trees averaged about two apples to the tree, the Doucin four, and the standards less than an apple. The crop of 1910 was almost a total failure, and it was not until 1911 that the yield could be taken in pounds, the averages per tree for the next four years running as is shown in Table II.

TABLE II
YIELDS IN DAWLEY DWARF APPLE ORCHARD

Number of trees	Stock	YIELD PER TREE			
		1911	1912	1913	1914
		<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
37.....	Crab.....	3	3	0	81
157.....	Doucins.....	5½	17½	2	51
300.....	Paradise.....	5⅓	16	⅓	70

In the Wood orchard, one apple was borne on a Boiken on Paradise the first year set. The second year, 1906, the trees on Paradise bore 180 specimens on 192 trees, the Doucin nine on 100 trees, while none of the 42 trees on French Crab bore. In 1907, the Paradise trees produced an average of a little over four apples per tree, the Doucin, two apples per tree, while the 42 French Crabs bore 26 fruits. In 1908, the yield came up to 14 apples per tree on Paradise, four apples for each tree on Doucin, and, all told, 17 apples on Crab. The yield in 1909, on Paradise was 30 apples per tree; on Doucin, 14 specimens; on French Crab but 18 apples for the 42 trees. As in the other two orchards the crop of 1910 was a failure. In Table III are shown the yields per tree for three remaining years of the test.

As the figures stand, the honors for productiveness seem to lie between the French Crab and Doucin trees. If we calculate the

TABLE III
YIELDS IN WOOD DWARF APPLE ORCHARD

Number of trees	Stock	YIELD PER TREE		
		1911	1912	1913
		<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
42	Crab	4 $\frac{1}{2}$	13	
100	Doucain	27	14 $\frac{1}{2}$	
192	Paradise	27	18 $\frac{1}{2}$	

number of trees per acre for the different stocks, however, allowing the smaller distances between trees for the dwarfs, then the Paradise, per acre unit, is most productive for this first ten years. Doucain next, and French Crab last. So many exceptions could rightly be made to such a calculation, however, that it is not worth making. Those who have had to do with the experiment have been surprised at the comparatively small yield of the trees of Paradise. Few, indeed, are the Paradise trees that have been bent to the ground with a load of fruit as they are so often depicted.

Time of Bearing. In considering age of bearing, it is important to keep in mind the age of the plants. Trees were budding for these experimental orchards in the summer of 1902. The Wood orchard was set in the autumn of 1903 and the other two orchards a year later.

In all three of the orchards, as the figures given show, the Paradise trees came into bearing soonest. In no one of the three orchards, however, was there what could be called a commercial crop on any of the stocks until the tenth year after setting, when if we take an average of the three orchards, the trees on French Crab bore 66.5 pounds each; on Doucain, 63.65 pounds; and on Paradise, 52 pounds. The figures must be thus roughly combined or else given in detail at a length of several pages of tabular material, the showing in either case being much the same; namely, that the dwarfing stocks bring apples into commercial bearing somewhat earlier than do crabs.

Size, Color, and Quality of Apples on the Three Stocks. From commercial standpoint, and this is a test of commercial plantings, the results as to effects of the three stocks on size, color, and quality, are, in a word, nil. There were, it is true, individual trees on Paradise and Doucin that bore particularly large apples and others that produced a handsomely colored crop, but when the product of all the trees of a variety was compared, one had to declare that the fruit on one stock was quite as large and attractive as that on either of the other two. Nor was there any difference in the flavor of the apples from the three stocks.

Varieties That Do Best on the Dwarfing Stocks. All things considered, possibly McIntosh, Wealthy, and the little Lady have been most satisfactory on dwarfs. Jonathan, Esopus, Grimes, Alexander, Wagener, Boiken, and Bismarck have been very satisfactory. Twenty Ounce has been the most unsatisfactory; it failed to make a good union at the start, and even the trees that made the best union have been unhappy on either of the dwarfing stocks. Baldwin, R. I. Greening, Rome, Ben Davis, Northern Spy, Sutton, the best known of the remaining 27 sorts, have not been especially kindly to the dwarfing stocks.

CONCLUSIONS

The following conclusions may be drawn from the work with dwarf apples at this Station:

1. It is difficult, but not impossible, to obtain varieties on the dwarfing stock one may choose because of confusion in stocks. The cost of the orchard per tree, and more particularly per acre, is high, since many trees are required.
2. In the cold climate of New York there is much danger of interkilling or winter injury to the tenderer dwarf trees. The French Paradise stock is particularly tender to cold.
3. When dwarfing stocks are used the union between stock and scion is not so good as in standard trees. Trees on French Paradise make poorer unions than do those on Doucin stocks.
4. Many varieties throw out roots from the scion if the union is at or beneath the surface of the ground. This entails annually the task of removing roots springing from the scion; otherwise the dwarf trees quickly cease to be dwarfs.

5. All dwarfing stocks have relatively shallow root systems that are undesirable, for the trees, young or old, loaded or unloaded, blow over, the orchard cannot be properly cultivated, the shallow-rooted dwarfs suffer more from drought than do the deep-rooted standards, and lastly, root injuries from plow and cultivator are more frequent with shallow-rooted stocks.

6. The suckering habit of the dwarf stocks is a vexatious trouble with which growers of dwarf trees must contend.

7. In the exceedingly variable climate of New York, it is difficult to find a method and a time to prune that are satisfactory in the summer. The results for which summer pruning is done do not always attend, and positive harm often follows because of weak, sickly, second growth, which so often is an after effect and which nearly always succumbs the succeeding winter.

8. The data secured in this test show that the trees on dwarfing stocks come into commercial bearing somewhat earlier than do those on standard stocks. There are no indications, however, that the dwarfs come into bearing sufficiently early or that they bear enough fruit to make them profitable as compared with standards.

9. It is a common claim that dwarf apple trees produce larger, handsomer, and better-flavored fruits than standard trees. There is little in these three orchards to substantiate these claims. There are differences between trees on the three stocks, but they are as often as not in favor of standards as of dwarfs.

10. The chief advantages of the dwarf trees are such as appeal to the amateur rather than to the professional apple grower. Thus, a dwarf tree occupies less space and a greater variety can therefore be grown in a garden or orchard. The plants are also handsomer as ornamentals.

NOTE.— Send to State Experiment Station, Geneva, N. Y., for Bulletin 406 on Dwarf Orchards.

THE PROFITS ON A BARREL OF APPLES*

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.

This paper is written for those who want data on the cost of producing a barrel of apples, on the yield of barrels per acre, the selling price, and the profits. It is not, however, a full consideration of the subject; for to obtain precise information as to what it costs to grow a barrel of apples, and from that to figure out the profits would be a complicated piece of business. An absolutely accurate reckoning for one year would not be difficult; but it must be remembered that it takes several years to bring an apple orchard into bearing, after which it barely maintains itself for a decade or two. In apple growing, too, rather more than in any other industry, the lean years and fat years are accentuated. More than with most other crops, also, advantages and disadvantages change from year to year. And, lastly, the value of the investment is exceedingly variable. But, notwithstanding these difficulties, the present paper puts into the possession of apple growers figures that, rightly used, ought to be helpful.

THE ORCHARD

The orchard from which the following figures were obtained is situated a few miles west of Rochester, known to many as the Auchter orchard, in which the Geneva Experiment Station carried on a test of sod mulch and tillage for ten years.† Added value is given to the figures to be presented by the fact that the orchard was selected for experimental work because it was as typical as could be found in the great apple belt of western New York. The trees are Baldwins, and were twenty-seven years old at the beginning of the experiment.

AVERAGE YIELD

The first information we must have is the number of barrels of apples per acre per year. The exact number for the cultivated

* See State Experiment Station Bulletin No. 376.

† See article by W. D. Auchter, page 803.

plat in this ten-year average is 116.8 barrels. Graded, the acre average for the period is 79.2 of barreled stock and 37.6 barrels of evaporator and cider stock. The proportion of evaporator and cider stock is seemingly high—made so by two autumn gales in different seasons, which gave many windfalls. Yields per acre vary greatly with the same variety in different orchards, even in the same section, but there is little reason to think that the ten-year acre average just given is much above the mark for orchards that are well tilled, sprayed, and pruned. The annual yields are shown in Table I.

TABLE I.
ANNUAL YIELD OF FRUIT IN AUCHTER ORCHARD FOR TEN YEARS

Year	PER TREE			PER ACRE		
	Barreled apples	Culls and drops	Total yield	Barreled apples	Culls and drops	Total yield
	<i>Bbbs.</i>	<i>Bbbs.</i>	<i>Bbbs.</i>	<i>Bbbs.</i>	<i>Bbbs.</i>	<i>Bbbs.</i>
1904.....	2.45	2.13	4.58	66.53	58.08	124.61
1905.....	1.42	.74	2.16	38.59	20.12	58.71
1906.....	2.67	1.44	4.11	72.69	39.12	111.81
1907.....	2.41	.88	3.29	65.53	23.79	89.32
1908.....	4.18	1.41	5.59	113.85	38.25	152.10
1909.....	2.37	1.64	4.01	64.63	44.57	109.20
1910.....	1.92	.69	2.61	52.21	18.80	71.01
1911.....	3.41	2.19	5.60	92.84	59.60	152.44
1912.....	3.86	1.70	5.56	105.05	46.17	151.22
1913.....	4.41	1.02	5.43	120.00	27.62	147.62
Totals.....	29.10	13.84	42.94	791.92	376.12	1,168.04
10-year average.....	2.91	1.38	4.29	79.19	37.61	116.80

INTEREST ON INVESTMENT

The first item in cost of production to be considered is interest on investment. What is a Baldwin orchard, in full bearing in the prime of life, worth? Sales are too few, and most of those that take place are made under conditions too abnormal to make selling price a safe gauge of value. We will suppose the value to be \$500 per acre and the interest 5 per cent. This valuation includes not only cost of land, trees, and labor, but the deferred dividends of the first twelve or fifteen years. It covers the overhead expense of houses and barns— or at least the share of these charges that would fall to a ten-acre orchard in New York. The first expense

item, then, is \$25 per acre on investment, a sum which, divided by 116.8 — the number of barrels per acre — gives a charge per barrel of \$.21 as interest on investment.

TAXES

Taxes vary greatly in different counties as they do somewhat in different years in the same county. Since this orchard is but a part of a general farm, only an estimate can be made of the cost of taxes. There are few regions or years in New York in which taxes for such an orchard would be over \$1.50 per acre, making the tax on each barrel of apples \$.012 cents.

DEPRECIATION OF OUTFIT

The next account to be charged to cost of production is depreciation in teams and tools, and interest on the money invested in them. First-class machinery for running the average orchard will cost in the neighborhood of \$1,000, the items being as follows: Team \$400, spraying outfit \$250, harness \$50, wagon \$75, plow, harrows, ladders, crates, pruning tools, etc., \$115. The figures named are below rather than above average prices, but there are few instances, indeed, in which the tools and teams named would be used exclusively for a ten-acre orchard. If we set the depreciation and interest on money at 20 per cent for the above equipment, we must add \$.17 per barrel of apples to the depreciation account. In obtaining the cost of production in the Auchter orchard, the depreciation account is thrown out, for the Station hired all work done, the workmen furnishing their own teams and tools. This item is put in, then, only as an approximation of what men who are doing their own work must charge for depreciation.

COST OF TILLAGE

Passing now to orchard operations, the annual cost of tillage per acre for the decade was \$7.39, making the amount to be charged against each barrel of fruit \$.063. In this orchard, tillage consisted of plowing the ground in the spring, after which it was harrowed and rolled, and then cultivated by harrowing an average of seven times per season. The price paid for team work at the beginning of the period was \$4 per day of ten hours; but the price advanced to \$5, a fair average being \$4.50. Tillage includes

the labor, or putting in the cover crop, but not the cost of the seed. For the cover crop seed — usually red clover in this orchard — there must be added \$2.74 per acre for seed, or \$.023 per barrel of apples.

COST OF PRUNING

The expense of pruning per year per acre was \$3.56, and, since there are twenty-seven trees to the acre in this orchard, the cost per tree was \$.131. The cost per barrel of apples was \$.03. The average price paid for the work was \$2.00 per day of ten hours.

COST OF SPRAYING

The average cost per acre for spraying was \$11.28; per tree \$.418; per barrel of apples \$.096. The spraying was done the first few years with a hand sprayer, then for several years with a Niagara gas sprayer, and the last three with a gasoline power outfit having two runs of hose. The first five years bordeaux mixture and arsenite of lime were used; the last five, lime-sulphur and arsenate of lead. The orchard was sprayed three times per season during the first five of the ten seasons. The second five years it was sprayed but twice per season, the first application being the dormant spray made just before the buds began to swell, and the second just as the blossoms dropped. This treatment has given an almost perfect crop, wormy and scabby apples being rarities scarcely to be found in the orchard.

EXPENSE OF SUPERINTENDENCE

The last of the cost of production charges is that of superintending the work. The services of the average fruit grower are worth more than the \$2 per day allowed for actual work, and this deficiency should be made up by a charge for superintending the work. The Station paid for this service \$300 per year. This is a fair price, since there are few competent orchardists who could not superintend a farm enterprise of several times the magnitude of a ten-acre orchard. The charge to be entered against a barrel of apples for superintending, then, is \$.25.

HARVEST EXPENSES

Picking, packing, sorting, and hauling have been done in diverse ways during the ten years, and the items cannot be segregated;

but the total cost of these operations has been \$.244 per barrel. The apples, it should be said, were sorted and packed in the field. The crop was hauled to a station one and a half miles away, over a country road no better than the average.

SUMMARY

The following is a summary of the cost sheet for a barrel of apples:

Interest on investment.....	\$.21
Taxes .....	.012
Tilling .....	.063
Pruning .....	.03
Spraying .....	.096
Cover crop .....	.023
Superintending orchard .....	.25
Picking, packing, sorting and hauling.....	.244

\$0.93

COST OF BARRELS

All of the first- and second-grade apples from the Auchter orchard have been packed in barrels. The average price of barrels for ten years has been \$.36 each; the price fluctuated from \$.30 to \$.40. The culls have been handled in crates, and a charge for packages cannot be entered against them. Adding the cost of the barrel to the cost of production, we have \$1.29 as the total cost of a barrel of apples at the shipping point.

TABLE II.

ANNUAL COST OF TILLAGE, COVER-CROP SEED, PRUNING, SPRAYING, HARVESTING, AND PRICE OF BARRELS IN AUCHTER ORCHARD FOR TEN YEARS

Year	Tillage	Cover crop seed	Pruning	Spraying	Harvest- ing (inc. bbls.)	Price of barrels
1904.....	\$21.25	\$12.50	\$14.62	\$58.22	\$210.90	\$0.375
1905.....	34.11	14.60	13.25	44.27	96.85	.30
1906.....	24.00	6.30	15.12	46.51	231.80	.32
1907.....	29.13	17.50	18.31	73.84	224.20	.40
1908.....	28.87	7.80	22.11	50.45	338.59	.36
1909.....	52.91	7.94	16.69	61.75	229.91	.35
1910.....	39.70	15.45	13.62	49.70	183.89	.35
1911.....	44.00	17.91	14.25	51.97	373.20	.35
1912.....	35.00	21.89	19.50	52.84	415.51	.40
1913.....	42.25	8.25	21.87	46.35	415.24	.40
Total.....	\$351.22	\$130.14	\$169.34	\$535.90	\$2,720.09	\$3.605
Average per barrel.....	.063	.023	.03	.096	.604	.36
Average per tree....	.27	.10	.131	.41	2.10	.....
Average per acre....	7.39	2.74	3.56	11.28	57.26	.....

PRICE OF APPLES

We have received an average of \$2.60 for all the barreled stock sold, which includes firsts and seconds. For evaporator and cull stock we have received \$.72 per barrel—rather above the average possibly, because in two seasons gales of wind, as has been said, gave an abnormally large quantity of very good windfalls. The yearly prices received appear in Table III.

TABLE III.
PRICE PER BARREL RECEIVED FOR APPLES IN THE AUCHTER ORCHARD
FOR TEN YEARS

Year	Barreled apples	Culls and drops	Year	Barreled apples	Culls and drops
1904.....	\$1.41	\$0.26	1909.....	\$3.35	\$1.10
1905.....	2.80	.66	1910.....	3.35	1.10
1906.....	2.00	.34	1911.....	2.50	1.10
1907.....	3.50	.79	1912.....	2.00	
1908.....	2.25	.37	1913.....	3.00	
Average.....				\$2.61	\$0.72

BALANCE SHEET

We are now ready to calculate profits and declare dividends. Subtracting \$1.29, the cost of a barrel of apples, from \$2.61, the amount received, a net profit of \$1.31 per barrel remains for firsts and seconds. Multiplying by 79, the number of barrels per acre, gives \$103.49 as the profit per acre for firsts and seconds. Subtracting \$.72 from \$.93 gives \$.21 as the difference between average cost of production and average selling price of culls. Multiplying 37.6, the number of barrels of culls per acre, by 2 gives a loss of \$7.89 per acre on the culls, leaving the average net profit per acre in this orchard for the past ten years \$95.60; add to this the \$25 interest on the investment and we have \$120.60 net, or 24.12 per cent on \$500, as the annual ten-year dividend from this orchard.

CENTRAL PACKING HOUSES FOR NEW YORK FRUIT

F. S. WELSH

Agriculturist, New York Central Railroad, New York City

The enactment of the New York Apple Grading Law has raised a question in the minds of many growers as to whether it might be desirable to use Central Packing Houses in packing fruit in order to comply with the requirements of the law. With a view to obtaining information that might bear on this question, the writer has collected data as to methods of operation of Central Packing Houses as they exist in the eastern part of the United States and especially in Canada, where apples are packed in barrels under a compulsory apple packing law similar in many respects to the New York law.

It was not thought that all of the methods employed would prove practicable under New York conditions, but it seemed that where there was a great similarity in methods of production and in the kinds of packages used, the same principles should apply in New York State as in the other sections, and that at any rate, since these sections were competitors of New York State, it might be desirable for New York growers to know what their competitors were doing, and planning to do, in the important matter of packing and marketing their crop.

The Canadian Apple Packing Law antedates the New York law by several years, and has now been in operation long enough to produce results. Two very apparent developments have followed the enforcement of this law: First, orchard packing has decreased and a great many Central Packing Houses have been put in operation, and, secondly, the quantity of Canadian apples exported has increased very rapidly in proportion to the total crop. The second development, Canadians believe, is caused to a large extent by the first.

WHY THE CENTRAL PACKING HOUSE CAME INTO BEING

The reason for the establishment of Central Packing Houses was a general dissatisfaction with methods of orchard packing,

and a belief that these methods did not allow due consideration for certain features essential to the successful marketing of fruit. The requisites for successful marketing, Canadian growers believed, were: First, the securing of large quantities of fruit that should be marketed under one brand; secondly, the uniform packing and standardization of this fruit so that each package was as nearly as practicable like every other package of the same grade, and, thirdly, the securing and utilizing of a knowledge of market requirements and conditions.

The methods of orchard packing used in Canada previous to the passage of their "Fruit Marks Act" were similar to those commonly used at the present time in New York State, and an analysis of them certainly shows that they did not permit of the fulfillment of the market fundamentals just mentioned.

By the first of these methods the grower picks and packs his own crop in the orchard, a method that does not bring a large quantity of fruit together for marketing under one brand, even if the grower produced from five to ten thousand barrels of fruit. At the present time, when organizations are putting on the market from 50,000 to 450,000 barrels of fruit under one brand, it will be seen that even 10,000 barrels make a comparatively small impression on a market receiving approximately 2,000,000 barrels of apples a year, as does the New York market.

Neither does this first method fulfill the second requisite, that of uniform packing, for aside from the variation that is certain to result from barreling an orchard tree by tree, the grower is always a biased judge of the quality of his own fruit, and the crop that he has labored to produce always seems a little better to him than his neighbor's, or one in which he has no personal interest. And thus because they belong to him, he will often permit apples to go into a better grade than that in which they would be placed if he were grading his neighbor's fruit.

During the operation of the Apple Packing Train, this point was well illustrated by the testimony of a western New York grower, who stated that he had shipped a car of "orchard packed" apples to the New York market and followed it to New York in order to supervise its selling. Describing his experience, he said: "When I saw those apples in New York City, if my name had not



FIG. 252.—CENTRAL PACKING HOUSE, WITH SEVEN MECHANICAL GRADERS DRIVEN BY $2\frac{1}{2}$ -HORSE-POWER GASOLINE ENGINE. CAPACITY, 200 BUSHELS OF PEACHES PER HOUR, PER MACHINE

been on the barrel, I should have sworn that I never had packed them, for they certainly did not look nearly so good to me there as they did in my own orchard."

By a second method in common use, the grower sold his fruit to a dealer or speculator, the grower picking and the dealer packing and paying by the barrel for the various grades that packed out. In this case the dealer had difficulty in satisfactorily supervising packing operations, which went on simultaneously in several orchards, and generally a dispute arose with the grower as to the quality of fruit to be put in the various grades. As it frequently worked out, the buyer's packer would be in "hot water" most of the time trying to follow his employer's instructions, defer to the grower's ideas, and maintain friendly relations. Consequently even if the dealer secured a large quantity of fruit that he marked under one brand, it was very seldom uniformly packed and standardized.

Under the third common method of orchard packing, the grower sold his fruit by the orchard, the dealer doing the picking and the packing, or the grower doing the picking and the dealer doing the packing. Neither of these two methods satisfactorily standardized the pack, because the dealer was now a biased judge of the quality of the fruit. He owned it and naturally wished to pack out as many "A" and "B" grade apples as possible, and was not therefore careful to set a high standard for his grade, nor to maintain that standard during the packing operations.

Since none of the methods of orchard packing fulfilled the requisites for the successful marketing of a large quantity of fruit, uniformly packed, the Central Packing House came into use. It has not only accomplished its chief functions but also has furnished a method whereby the grower is relieved of the responsibility of supervising unreliable labor during the busy packing season, and has avoided personal interference on the part of grower or buyer in the endeavor to place his fruit in the better grades.

TYPES OF PACKING HOUSES

Two types of packing houses are in use. The one most commonly used in Nova Scotia, where the Central Packing House idea is extensively developed, is a frost-proof (common) storage with a packing room added.

The storehouse is erected either by a local buyer or by a cooperative company. The type of building is shown in the pictures and diagrams. The warehouse is so arranged that delivery from wagons can be made on one side and shipment by rail on the other.

The apples are hauled to the packing house in barrels, unheaded or loosely headed without grading, except that culls are separated so far as possible in picking.

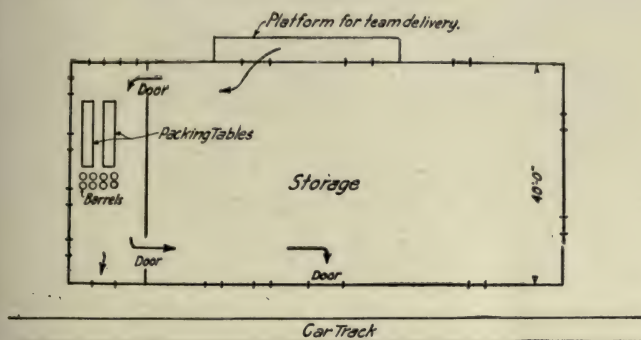


FIG. 253.—USUAL FLOOR PLAN OF PACKING HOUSES. ARROWS SHOW HANDLING OF APPLES IN PACKING. PACKING ROOM GENERALLY PLACED WITH SOUTH OR SOUTHEAST EXPOSURE TO SECURE GREATEST AMOUNT OF LIGHT

The second type of Central Packing House is that in which the fruit is packed for immediate shipment to storage or market, as soon as possible after being received, instead of being held at the packing house for any appreciable length of time.

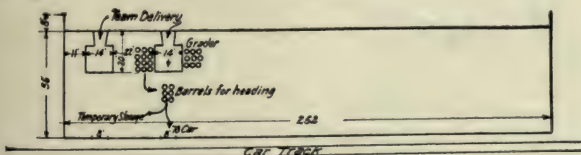


FIG. 254.—ARRANGEMENT OF GRADERS IN PACKING HOUSE WHEN APPLES ARE TO BE IMMEDIATELY PACKED AND SHIPPED. ARROWS SHOW MOVEMENT OF APPLES.

In this manner small quantities of fruit may be packed in cheaply constructed packing sheds without mechanical graders. The accompanying cuts show a type of shed used for this purpose by a Canadian Growers' Cooperative Company, three thousand barrels of fruit being received, packed, and shipped to storage in this shed annually.

Another type of packing house well adapted to the packing of fruit with a mechanical grader is shown in the accompanying cuts and diagrams. The special feature to be observed in its construction is the provision of a clear, bright light over the grader and convenient facilities for delivering the fruit to the grading machine.

The building shown in the cut was used especially for packing peaches with the details of construction adapted to a peach-grading machine, but these could easily be changed to suit the type of apple grader to be used, and even now apples are graded to some extent in this house.

METHODS OF HANDLING FRUIT

The apples are hauled on wagons with springs, or on hay racks containing a quantity of straw, to packing houses at various distances up to eight miles. The estimated cost of such hauling being about five cents a barrel for a three-mile haul.

The grower receives a receipt for the number of barrels he delivers. The apples are stored, each barrel bearing the grower's name or number and the variety. Later they are packed, generally just preceding shipment, by a gang of expert packers who have no knowledge of whose apples they are packing. In this manner the fruit of all the growers delivering to the packing house is standardized and bears the same label. After packing, the grower receives a statement from the packing house manager as to the number of barrels and the grades that packed out. In cooperative associations no credit is given for culls. Those found in packing are sold, and the receipts are credited to the general packing expense. The expense of packing is then prorated according to the number of barrels delivered to the Central Packing House, and not according to the number of barrels that pack out, this arrangement being made in order to minimize the handling of culls and the delivery of slack barrels.

The grading and packing in these houses is generally done without mechanical graders on a padded sorting table, from which the apples are packed into baskets and then put into barrels. The packers generally work in gangs of six or seven men, a foreman, two sorters, a man to face the barrels, one to rack down and head



FIG. 255.—SKYLIGHT DIRECTLY OVER GRADERS, AND NO POSTS TO INTERFERE WITH TEAM DELIVERY.

the barrels, another to deliver apples to the grading table, take away packed barrels, and place empties. The foreman helps wherever necessary. Such a gang working ten hours a day, it is said, will pack from ninety to one hundred and fifty barrels, depending on the quality, size, and uniformity of the fruit, and the number of varieties on which they work. The cost of packing under this system is given as from nine to seventeen cents per barrel.

An additional charge of from three to ten cents a barrel is made in plants with a storage capacity of 10,000 barrels and upwards in order to cover storage, manager's salary, interest and repairs on warehouse, and expenses of handling incidental to loading on cars. The managers, however, are sometimes paid by the barrel, or, where cooperative selling is practiced, receive a percentage of the returns obtained from sales. Such a method of operation as has been described is, of course, especially practicable for cooperative associations of small growers who expect to use only common (not refrigerator) storage and desire to standardize and market their fruit under a common label. In such organizations the common practice is to pool the fruit, sell it, and return to the grower the season's average price on the different varieties and grades.

When large amounts of fruit are to be handled, however, much more rapid grading is necessary, and a mechanical grader must be employed. The type of grader to be used depends on the capacity desired and individual preference for the principle of operation.

Mechanical graders with a capacity of two hundred and fifty to four hundred barrels a day are being operated in houses similar in type at a packing cost of from six to twelve cents per barrel, by using a gang of from eight or ten men.

Those using mechanical graders assert that the most desirable method is to pick into crates in the orchard and haul directly to the packing house, the apples being dumped from the crates on the table of the grader or its conveyor. Each grower receives a receipt on delivery. A small book is kept in the office for each grower, in which each load is entered as it packs out. The cost of packing is apportioned to the number of bushels delivered, and the culls are sold and credited to the general packing expense account.

PRACTICABILITY DEMONSTRATED BY INCREASE

The increasing use of central packing houses in Canada, both by dealers' and farmers' cooperative companies, would seem to prove the practicability of the central packing-house system under a compulsory apple packing law, and should, therefore, prove successful under New York State conditions. The central packing house makes it possible to pack uniformly a larger quantity of fruit under one label and facilitates marketing by enabling the packer or packing company to acquire a reputation for their brand, and to refill repeat orders from satisfied customers before this brand is forgotten.

In the Annapolis Valley in Nova Scotia, where the central packing-house system is extensively developed, nearly ninety per cent of the fruit grown is packed in central packing houses, either in the packing house of the dealer, or that of a cooperative company, the reason for this being that the better and more uniformly packed fruit from these houses will bring better average prices than orchard packed fruit.

Now that they have secured through the central packing house the uniform grading of a large quantity of apples to be sold under one label, it is interesting to see how the fruit growers of Nova Scotia are attacking the question of selling their product, and the further question of securing and utilizing a knowledge of market conditions, which they believe is the third requisite for successful marketing.

COMBINATION OF PACKING HOUSES

Several years ago, some thirteen of these central packing houses decided to pack the same grades of fruit, pool it, and sell it through a central organization. The following year thirty-three companies followed this plan, and last year there were forty-three subordinate packing houses that marketed their fruit through the central office of what is now known as the United Fruit Companies, Ltd., of Nova Scotia. The central office representing these companies controlled approximately 450,000 barrels of fruit, packed as uniformly as possible by the subordinate packing houses; and, because the company handled so large a quantity of fruit, it was able to accomplish in the way of systematic marketing what separate companies could not have done.

They have representatives abroad and on the Pacific Coast, who in addition to soliciting business, inspect the condition of fruit on arrival and see that it is not misrepresented and that carting charges are not duplicated. They also keep the central office advised as to the condition of the various markets and the quantities of fruit en route to them. If it appears that the Liverpool market, for example, is likely to be over supplied, the United Fruit Companies route a shipment to London or to Glasgow, Scotland, or time a consignment to arrive at Liverpool about the time that the glut should be cleared up and better prices prevail. By this system the United Companies of Nova Scotia claim to receive better average prices for the season on their fruit than are obtained for fruit of similar quality.

They have also built up a reputation for their brand, so that retailers and distributors in the English markets have expressed a preference for it. The remarkable part of the whole organization is that this entire system of marketing was accomplished at relatively little expense. The average sales expense of a barrel of apples is approximately only four cents, an item that takes the place of the commission charge they previously paid.

It is in this way that these fruit growers are endeavoring to comply with the apple-marketing fundamentals; first, a large quantity of fruit under one brand; secondly, a uniform package, and, thirdly, a utilization of knowledge of market conditions.

PLAN WELL ADAPTED TO NEW YORK STATE.

There are ample facilities for the establishing of central packing houses in New York State. A dealer may easily establish such an institution in connection with the warehouse that he uses and insist that all fruit that he purchases must be delivered to him at the packing house and there be packed under his brands. It may be that he will eventually pack fruit that he does not buy, charging a specified price for each barrel, but insisting that fruit so packed shall be packed under his labels, and that he shall receive a commission for selling it.

A second method that will probably come into use will be the formation of packing companies in connection with cold, or common, storage warehouses. These companies will charge a specified

price by the barrel for the packing, and assume the responsibility for complying with the requirements of the New York Apple Grading Law. They will place on the barrel the individual farmer's brand, in addition to the markings required by the Apple Grading Law.

The third method, practicable in New York State, is one that has resulted in the establishment of so many packing houses in Canada and parts of the eastern United States; namely, the formation of cooperative associations among growers. These organizations either erect or rent packing and storage space, employ their own manager, pack under an association brand, and sell their fruit through their manager, or through an affiliation of similar organizations.

In New York State, the use of central packing houses established under any of these methods is certain to result in an improvement of the package over the orchard packed fruit, and will be the first step that must be taken by growers if they are successfully to meet competition in the apple markets of the world and to obtain prices that will enable them to grow fruit with profit.

SELLING ON COMMISSION AND BUYING DIRECT FROM PRODUCERS

J. H. KILLOUGH, NEW YORK CITY.

The subject of marketing farm produce has of late years attracted widespread discussion. It has engaged the attention of thoughtful students of trade economics, of those seeking to pose as reformers in the estimation of people misled by false and exaggerated statements, and of practical market men whose permanency in the distributive economy depends on their adaptation to changed and changing conditions of trade.

DIRECT SALES TO CONSUMER IMPRACTICAL EXCEPT IN A SMALL WAY

In the great centers of urban population the day of direct dealings between producers and consumers has long since passed with insignificant exceptions having no bearing upon the main problem. In the metropolitan district of New York and its suburbs, for instance, there may be two or three millions of people where farm products must be brought for service to the millions of individuals as food; and the domestic products so required drawn from all parts of our country. It is hardly necessary to refer to the manifest impossibility of direct dealings between the myriads of consumers and more or less widely separated producers. Clearly, the products needed by the consumers must be assembled in appropriate kind, quality, and quantity in depots where they may be reached quickly and conveniently by millions of circles of consumers throughout the length and breadth of the urban communities. Even these widely scattered depots, represented by retail stores, cannot to any considerable extent obtain their supplies directly from producers, because their requirements are selective and not of volume to permit direct economical transportation, and for many other reasons. They must draw from other and larger depots where the great variety of farm products can be assembled, classified, and often graded as to quality, and where regular supplies can be quickly obtained, according to the needs of their customers. These large

depots correspond to the jobbing houses, which in all great markets perform the necessary function of drawing supplies from the water receiving stations, assembling them at points convenient to the smaller retail distributors, and dealing them out in lots as needed.

These larger depots, distributing to retailers, may or may not draw supplies directly from producers or from interior collectors of produce, according to circumstances. As a rule, in the normal and unrestrained development of the distributive machinery, they do not. Their requirements are too much specialized and usually too immediate to permit dealings with primary sources of supply so remote. In practice, they deal for the most part with the larger wholesale markets, which are the first recipients of the city's supply of food products.

There is nothing in the constitution of the distributive machinery of a great city which bars a shortening of this course of distribution as a result of open competition, whenever it can be done economically and in such manner as to meet the demands of consumers. The distributive machinery contains within itself the seeds of its own economical development, and short cuts of distribution are continually being established in regard to particular packings of produce as opportunities arise. But the fact that, in the main, despite a free and open competition, these different centers of distribution — the first wholesale receiving depots, the second selective or jobbing depots, and the third retail depots — have persisted, is conclusive evidence of their necessity; and all the rantings of demagogues or efforts of would-be reformers, based upon ignorance and misconception, can never eliminate them any faster than the forces of the trade itself will remove agencies of distribution that may, from time to time, become obsolete as to particular products.

The producer cannot, with a few minor exceptions, deal directly with these secondary or subsequent agencies of city distribution. He is, except in a few cases, too far away for personal disposition of his goods by the buyer; the determination of values is difficult unless goods are subject to immediate demand from numbers of buyers; the machinery of salesmanship is not economically available to a producer selling farm products to

classes of trade whose demands are selective. And, furthermore, his products are seasonal, and the business of carrying such of them as are capable of being carried to seasons of nonproduction cannot be economically done on the farms, if modern facilities of preservation are employed.

TRUE FUNCTION OF THE COMMISSION MERCHANT

The business of primary city distribution, at least in the greater cities, must therefore be done chiefly by wholesale receivers who can handle the entire crop of a distant producer, either by purchase upon some definite price or basis of valuation agreed upon, or as an agent acting for the producer. This latter agency is the true function of the commission merchant, who thus occupies a logical and indispensable place in the natural development of distribution.

The natural, logical, and legitimate function of the commission merchant has been covered up and obscured in the public mind and in the minds of many producers of farm products by two classes of agitators: first, by those who with no economic or practical knowledge of distributive necessities have ignorantly classed all middlemen, and commission merchants in particular, as parasites and a useless excrescence upon the food industry; secondly, by those who have seized upon occasional instances of dishonesty in the business to characterize the whole as corrupt, and who attribute to the wholesale receiving trade powers of control over the prices of farm products which in fact have no existence.

Charges of uselessness of the produce commission trade are utterly ineffective; the trade will persist as long as it is economically needed and no longer. As to charges of dishonesty, there is doubtless dishonest dealing among produce commission merchants just as there is among men in all other pursuits — there is no good reason to believe it to be more. Reputable merchants are favorable to any reasonable system of state protection of shippers' interests which will effectively weed out dishonest dealers whose competition is always a thorn in the flesh of the more scrupulous. Certainly the economic necessity of shippers' agents cannot, as a principle, be condemned because some are

not straight. There are abundant means of determining reliable personalities and of forming close and satisfactory relationships between principals and agents, if intelligent effort is directed to this end.

In respect to the more staple farm products — such as may and must in large part be carried in storage from seasons of surplus to season of nonproduction — the arrangement for the sale of a crop through commission agents permits the grower, if he so desires, most easily to take part in this more or less speculative feature of the business. But the storage of surplus productions for later use is a business that requires astute judgment and a broad knowledge of prospective supply. Even to the most astute, it is a hazardous phase of the distributing business and is most naturally engaged in by the larger wholesale receivers who, as a rule, act both as commission agents and as dealers on their own account.

From the point of view of the producer, the formation of close and confidential relations with a reliable commission agent for the sale of his products would seem to be the most logical method of marketing; the success of such relation depends upon an intelligent understanding on both sides, a mutual and deserved confidence, and a willingness on the part of the shipper to be guided by the experience of his agent in all matters pertaining to grading, packing, etc. There is good ground for the assertion that a reliable and competent commission agent can place a shipper's products in the most favorable channels of distribution more cheaply than it can be done by any other means.

BUYING FROM THE ORCHARD

Comparing the commission method of sale, particularly of orchard products, with the system of selling outright at the orchard, there are two points of view. As a rule, under usual conditions, it will be found that the buyers are the same class of merchants who act as commission merchants, and it is to be considered that a merchant buying fruit and dealing in it on his own account requires and deserves a larger profit than he would be satisfied with as a commission. If the grower could so pack and divide his fruit as to sell it directly to the smaller classes

of distributors — that is, to the customers of the commission merchant — there would seem to be a saving, until it is considered that the jobber has no inducement to go to the country to buy, incurring additional expense, unless he can buy cheaper than from the commission merchant, where he can choose and select from a larger assortment. Therefore, although there are doubtless exceptions, the advantage of country selling will probably prove to be nothing in general practice, except in cases where the grower and packer is astute enough to take advantage of speculative buying on an abnormal basis — occasions which are not frequent.

EXPORTING APPLES

C. W. KIMBALL, NEW YORK CITY



A number of pages might be written regarding the exporting of apples, but, without going into details, let us consider briefly the essential requirements and results connected with this branch of the apple industry.

GROWTH OF THE BUSINESS

That this branch of the apple trade is most important can be seen from the following totals of exports during the last 35 years:

Periods of exports	No. bbls. Exported
1880-1889 (10 years).....	7,201,183
1890-1899 (10 years).....	12,933,117
1900-1909 (10 years).....	22,386,805
1910-1914 (5 years).....	13,620,378

From this it can be noted that the export movement has doubled during the last fifteen years. Further, during this period average net prices have increased 35 per cent.

Such figures, showing a tremendous increase in tonnage and growing values, are a fitting preface to this article, and an eloquent call to the importance of fostering foreign demand for American apples. American apples have been generally and favorably known in England for years; and, while England is still far in the lead of all other countries as a consumer of this commodity, there has sprung up in recent years a material and constantly increasing demand for this fruit in the northern countries of Continental Europe, in South America, and in Australia.

IMPORTANCE OF EXPORTING ONLY THE BEST

Many attentions are necessary in the harvesting, transporting, and marketing of apples in foreign countries to make this business satisfactory and profitable to those engaged therein, but the primary and most essential of all the requirements may be

summed up briefly in this: pack only good quality; market only good quality. Success in an attempt to market apples profitably abroad is not always attained; failures are often due to reasons other than overstocked markets, poor quality, and poor packing. Poor transportation facilities, delays, bad ventilation, use of ordinary storage when cold storage was necessary, neglect in having all packages tightly packed and made additionally solid, and, further, the selection of varieties suitable for various markets — all or any of these signal danger, and result in disappointments and losses, whereas by proper attention to the requisites of safe and satisfactory delivery to the consumers abroad, suitable returns might be enjoyed.

VARIETIES FOR SPECIAL MARKETS

Great markets of the world, such as are buyers of American apples, have, like the American markets, a marked preference as to varieties and also as to the time when different varieties are in greatest demand. Therefore, the exporter should determine by correspondence at what rate and at what time his apples may be best marketed abroad.

Such a general treatise as this cannot easily set forth in detail all the minor facts, essential though they are, particularly as each market of each consuming country has its own specially favored variety or varieties of apples. However, Baldwins may generally be said to be well accepted everywhere, with the exception of South America, perhaps, where still more hardy kinds become necessary on account of the trying ocean transportation and climatic conditions.

SALES BY AUCTION

In regard to the selling of American apples in all the large markets of Europe, there is, generally speaking, one method in vogue — selling at auction. Upon the arrival of an apple-laden steamer the apple cargo is invoiced, cataloged, and advertised to be sold at one or another of the fruit auctions established for that purpose. This method of selling seems to be the proper method, and one by which the best results may be obtained under conditions of fruit delivery across the Atlantic. There, constant, regular, and uniform supplies may not be secured as in our own

markets. Foreign markets are supplied in accordance with the schedules of ocean steamers and in keeping with the space they offer for this commodity. It may be noted that supplies are often in excess of demand and prices average low, while perhaps within a week following, under lighter receipts abroad, prices mount materially higher. Therefore, values that may be expected and obtained, in connection with this export trade, vary in ratio to the supplies available and to each importing country's domestic business conditions.

COMPETITION WITH CANADIAN APPLES

Generally speaking, the entire crop of Nova Scotia and a large percentage of the crop of Ontario must of necessity find a market in Europe, and the probable quantities produced there must be considered in reckoning prospects for apples sent from the United States. This fact must be taken into consideration when figuring possible profits that may be realized from the exportation of apples: There is no reasonable chance of succeeding, to any degree, by the exportation now and then of a parcel or a carload in an attempt to obtain high prices as indicated in market reports from abroad. There are too many others attempting to do exactly the same thing, the result being that an oversupply is forwarded to participate in those particularly attractive prices. This of course, means too heavy offerings and a break in values. Success is best obtained by the exporter who begins with the season, ships gradually and regularly, and profits by the average values of the season.

THE SOUTH AMERICAN TRADE

Much has been said, many questions have been asked, and considerable stress has been laid upon the demand for apples in South American markets, and upon the growing consumption there displayed. This has been materially overrated and does not hold the importance to the apple business that many believe. Although American apples are appreciated in the South American countries, the cost of delivering to the consumers there is so great that the trade never has enjoyed or never will attain to any material portion. This can be understood when it is known the cost connected with this business totals an average of eight dollars per

barrel from the port of New York to the port of Buenos Aires. This is the mere transportation cost from port to port. To this must be added cost of the fruit and various handling charges. Therefore, when we approach the consumer in South America with apples having a wholesale cost in those markets of twelve to fourteen dollars a barrel, there is a small chance of building an extensive demand.

PROSPECTS FOR CROP OF 1915

The outlook for the current season may be said to be both favorable and unfavorable. Favorable, for the reason that England and some other European countries labor was never so thoroughly and so profitably employed, and this means ready sale at good values, for any popular food offerings. Unfavorable, for reason of Germany's markets being eliminated; by reason of increased ocean freight rates as compared with other years; by reason of cold storage accommodations aboard steamship being unattainable; and by reason of the transportation facilities offered which are as a rule less safe than in former years, owing to the fact that the fastest, best ventilated and most desirable of ocean steamships have been eliminated from the service, and slower, poorer steamships for the purpose substituted.

However, it is expected that space for apples this season may be had in about the same proportion as last year, and that steamship companies will be able to transport practically the same quantities as last year, providing prices may be obtained abroad justifying such a movement. Ocean rates to the principal ports of England are now fixed at approximately \$1.25 per barrel, and to Scandinavian ports at approximately \$2 per barrel. These rates seem high; and, coupled with a higher initial cost of apples ruling, the apple trade cannot well expect an export movement greater than 65 per cent of that of last season.

AUCTION HOUSES AS DISTRIBUTORS OF FRUITS AND VEGETABLES

VICTOR K. McELHENY, JR.,

President of The Fruit Auction Company, New York City, and of the American Fruit and Produce Auction Association

PUBLIC ATTENTION CENTERED ON THE AUCTION SYSTEM



In recent years a tremendous impulse has been given in all lines of business to the adoption of efficient up-to-date methods. Growers and shippers have made great strides in growing and in packing. Crops, as well as population, are increasing. The problem is so to increase distribution as to market these crops satisfactorily. This important marketing problem has centered attention upon the public sale system of selling fruits and vegetables.

PREJUDICE DIES HARD

Whenever the word "auction" has appeared, it has suggested a red flag — a man standing on a counter or chair, calling loudly, and knocking down under the hammer whatever by way of rubbish happens to be at hand. With regard to the public sales of fruit as conducted by the large auction companies, the picture is so entirely different that it is hard to make a comparison.

HISTORY OF THE BUSINESS

In this country, public sales of fruit and vegetables are young compared with the business abroad. In England, Germany, and France public sales of fruits and vegetables are tremendously important and are becoming increasingly so. Public sale has been in practice abroad for one hundred years; all varieties of fruits and vegetables are there sold at public auction, also plants and cut flowers. The importance of public sales in Great Britain will be emphasized when it is stated that during the past year England

imported into Liverpool, London, and Glasgow about 1,788,236 barrels and 1,096,054 boxes of American and Canadian apples, nearly all of which were sold at public auction. In the United States, public sales began at about the time of the Civil War and have had a wonderful and sound growth ever since. Today, 85 per cent of the Florida oranges and grapefruit; 75 per cent of the pineapples, oranges, and grapefruit from Porto Rico, Cuba, and Isle of Pines; 98 per cent of the California oranges, lemons, cherries, peaches, apricots, pears, plums, and prunes; and 100 per cent of the Sicilian lemons, Almeria grapes from Spain, and the cherries, pears, and prunes from the Pacific Northwest, which are consumed in the large cities of the eastern part of the United States — are now sold at public sale. In addition, the bananas that are consumed in New York and Baltimore are disposed of in this way, and also in some cities, tomatoes, canteloupes, peaches, watermelons, and potatoes. Last year, one hundred and fifty thousand dollars worth of chestnuts from France, Spain, and Italy added to the vast volume of business going through the auction companies of New York.

SERVICE RENDERED BY THE AUCTION HOUSES

The auction house, upon receipt of a manifest of the fruit to be offered for sale, advertises the sale, giving the day and hour, and prints a catalogue of the offering. In the catalogue the fruit is divided into convenient sized lots, according to sizes and grades of the fruit, and each grower's fruit is sold separately. The offering is "lined up" on the railroad pier according to the line numbers on the catalogue, in order that the fruit may be readily inspected by the buyer and a notation made by him on his catalogue as to the condition and quality, and so that the fruit can be speedily delivered after the sale. The auction house opens a certain number of packages of each offering for the buyer's inspection; sells the fruit at public auction to the buyer making the highest bid; makes a record of the sale; superintends the delivery of the fruit sold to the buyer; discounts and guarantees the amount of the sale; supplies the seller with a price catalogue of the prices realized on the sale; and, within twenty-four hours of the sale, sends the seller an account-sales, together with a check for the proceeds of the sale.



FIG. 256.—DISPLAY OF CALIFORNIA CITRUS FRUITS SOLD AT AUCTION ON ERIE R. R. PIER 20, NORTH RIVER, NEW YORK CITY

PUBLICITY AND OPEN COMPETITIVE BIDDING IMPORTANT FEATURES

An important feature of the auction system is that its workings are in plain view of all. Daily auctions are public sales in every sense of the word. The auction companies have no business secrets. Any questions that may be asked of them can and will be answered upon communication with them. The public sale system calls for a complete daily record of sales, which is printed, and may be referred to at will by both seller and buyer. Not less important than publicity — in fact it might be called the keystone of the auction system — is the selling of the commodity to the buyer who will bid the most after open competitive bidding. The commodity is offered for sale in such sizes and grades that no buyer is compelled to purchase something that he does not want in order to secure what he wants.

THE PRIVATE SALE WAY

Picture a large business — for example, that of the New York State barrelled apple, the northwestern boxed apple, the cantaloupe, the watermelon, the peach, or in fact any line of fruit or vegetables where the production has become large — divided into small, scattered selling units rather than concentrated in one place. Picture the buyers scattered. Picture two men quietly negotiating over the price. The seller is trying to get as high a price as the drift of the market will stand. He is handicapped by the fact that he must keep in mind the retaining of the buyer's patronage. The seller is further handicapped by not knowing what supplies his competitors are offering. The seller has undesirable sizes and grades of fruit which the buyer does not want, but which the seller is inducing the buyer to take by offering the desirable fruit for less money. The buyer is trying to obtain the fruit at as low a price as he can. No public record is kept of the price for which the goods sold.

THE PUBLIC SALES WAY

After viewing this mental picture, compare the private sale system with the public sales in the auction room, and you will gain the viewpoint of the progressive grower of California and Florida. Picture all the fruit and all the buyers concentrated in one place

at one time. The buyers arrive in time to inspect the fruit, which is displayed in one large warehouse or on the railroad pier. In that large exhibit each buyer — whether the fine fruiterer, the department store, the chain store, the retail grocer, or the pushcart man — finds the sizes and grades that he wants, or in fact that he must have if he is to keep his customers from going next door for their fruit. At a given time the gong rings and the buyers assemble in the sales auditorium. As a winning bidder needs to take only a limited number of boxes, the representative of the largest jobbing house, department store, grocery house, chain store, hotel, or large restaurant in town, who needs 200 boxes of a certain grade of fruit, must bid against a buyer who wants but a limited quantity. With this free working of the law of supply and demand the price is fixed. Frequently, personal rivalry among several bidders results in the price being raised above what the natural law of supply and demand warrants. Many a buyer goes to the auction with the idea of buying but fifty boxes, and goes away the purchaser of one hundred. He sees what he thinks he can make money on and buys. In the next hour he and all of his farm are at work trying to sell the fruit he has bought.

In addition, every public sale is a matter of public record. The catalogue and sale sheet are kept for a certain period before their destruction is permitted. Some of the auction companies keep their papers for years. The shipper can write to the auction company and get a mailing catalogue showing the correct prices. In the city of New York, for example, the *Daily Fruit Reporter*, an independent paper, publishes each day the results of the sales, car by car and brand by brand. Anybody may sit in the public sales auditorium and hear the auctioneer sell the fruit to the highest bidder at a certain figure. He may note on a catalogue what his fruit sold for and then compare that with the account-sales subsequently rendered by the auction company. He will find that they agree entirely.

THE AUCTION PRICE STANDS

No private salesman can get from the buyer more than the market warrants. If a buyer overreaches himself and finds he

has paid more than his competitor, he goes back to the private seller and asks him to cut down the price to what his competitor paid. The private seller does this to hold his trade. The auction price stands and admits of no reduction.

THE AUCTIONEER

The men who do the actual selling must be efficient. It takes years for an auction company to train a man for auctioneering. The auctioneer must be a specialist in the fruit business. His duties require him, just previous to the sale, to examine the fruit that he is to sell as to quality and condition, and make a notation on his catalogue so he can secure the highest price for the different grades of fruit. He must also know the quality and condition of the fruit sold by his competitor. The auctioneer pays a license fee and is under bond to the municipality.

COMBINATION OF BUYERS IMPOSSIBLE

There are too many racial differences and too many varying interests involved to enable the buyers to form a combine in the market. There are Greeks, Hebrews, Irish, Germans, Italians and Americans, both large and small buyers, at every public sale. The auction companies have made combinations impossible by forbidding one buyer to bid for any other who is present at the sale. Competition in bidding is keen in this striving in the open public sale; and the price of fruit is forced upwards to the point at which there is only a small profit for the wholesale merchant. The grower who sells at public sale has yet another check. His agent can quickly discover any combination that might be attempted. It is his privilege to withdraw the fruit from public sale.

NO WILD FLUCTUATIONS AT AUCTION

There are no wild fluctuations in the prices at auction. The fruit and the buyers are all in one place and the law of supply and demand is not interfered with. The fruit auctions are held regularly every day (Saturday excepted) in the large cities, at a scheduled time. The buyers who attend these sales make a regular business of buying and selling fruit. All of them have



FIG. 257.—SALE OF ALMERIA GRAPES IN AUCTION COMPANIES' MAIN SALESROOM, 204 FRANKLIN STREET, NEW YORK CITY

an outlet through the consumer; they supply fruit to the retail storekeeper, the wagon peddler, steamers, trains, and to dealers in nearby cities. All of the buyers speculate occasionally, but the great bulk of their buying is to supply a present need.

EXPENSE

There are few points connected with the marketing of fruit that equal in importance the matter of expense. It is, therefore, well to remember that the public sale system of selling fruit enables the grower to get prompt returns from the auction companies at a low selling expense, and to obtain for fruit, prices which are produced only by active, competitive bidding.

RELIEF OF A GLUTTED MARKET

A public sale can relieve a glutted market as no other medium can. Just as soon as the market sags, the representatives of the peddlers and the pushcart men at the public sale buy heavily. With all the pushcarts and peddlers' wagons featuring a commodity, many handling nothing else for the time being, vast quantities of fruit can be disposed of in case of a glut. The result is that consumption is greatly increased, the glut relieved, prices rebound, and the market becomes normal.

The public sale system has a particular advantage over private selling, in that, once the glut is relieved, the stimulated rate of consumption sends prices upward at once. It is quickly apparent that a number of buyers want a certain kind of fruit. No buyer can hide the fact. He must bid briskly and high if he is to get the fruit that his customers want.

THE AUCTION SYSTEM EQUALLY POTENT IN BRINGING BETTER PRICES TO THE GROWER WHEN THE CROP IS SHORT

Apples are a short crop this year. An illustration of how an auction sale of New York State apples benefits the grower is the auction sale of barreled apples held in the orchards of certain growers at Red Hook, Gardiner, and Syracuse, on September 1, 2, and 8 of this year, by the company of which the writer is president, under the auspices of the New York State Department of Foods and Markets. Notwithstanding a new system was being

inaugurated, and in the face of strong opposition, the following happened: It was a matter of common knowledge that previous to the auction sales buyers were paying farmers \$2.50 per barrel for Grade A fruit, declining in all cases to buy Grade B fruit, and in a very few instances for some high-class fruit \$2.75 per barrel was paid for Grade A fruit. At the auction sales the lowest price paid for Grade A was \$2.70 per barrel, and the highest price paid was \$3.40. In most cases the price paid was from \$2.80 to \$3.40 per barrel for Grade A. Grade A and Grade B in one orchard were sold together for \$3.40 per barrel. Grade A and Grade B apples together of another orchard sold for \$3.00 per barrel, and Grade A and Grade B apples together of three other orchards were sold for \$2.85 per barrel and \$2.75 per barrel respectively.

AUCTION REALIZES THE HIGHEST MARKET PRICE FOR HIGH-CLASS
FRUIT AS WELL AS FOR INFERIOR FRUIT

A relic of ignorance and prejudice on the subject of public sale as a means of distribution is the feeling held by some of the less well-informed that the auction might sacrifice high-class fruit. Nothing could be farther from the fact. There are present at each sale the fine fruiterers, high-class grocery houses, brokers representing high-class hotels, restaurants, and retail houses, and jobbers who specialize in high-grade fruits — all interested only in high-class fruits. The result is that these fruits are bid up to the highest price that the market will warrant. In fact, prices are realized at times for high grades of oranges, grapefruits, Spanish grapes, lemons, pears, California grapes, plums, and cherries, which are sold at auction, that could be secured in no other way. Furthermore, the auction is the keenest discriminator between the fruit of the careful grower and packer, and that of the careless one. Every grower and packer who uses intelligence, time and care in the production and packing of his fruit, wants these elements recognized. No system equals the auction in recognizing what is good and in paying for it accordingly. The auction is the place above all where each grower's effort stands on its own merits.

PUBLIC SALE WIDENS DISTRIBUTION

A recent concrete example of the way public sale of fruit increases the number of buyers, and thereby widens distribution, is the sale of bananas at public auction in the cities of New York and Baltimore. The company importing the largest amount of bananas changed from private sale to public sale in New York city, April, 1913, and in Baltimore, July 1, 1914, with the result that the number of buyers increased nearly tenfold. Although it has happened that in a single year in some public-sales cities, sales of California deciduous fruits have increased 30 per cent, and 100 per cent in a period of five years; when California had a heavy crop, the public sale has been sufficiently flexible to take care of and distribute the increased crop. Similarly, sales of Florida oranges in Boston have, in a period of five years, at public sale, increased 350 per cent.

Now compare with the foregoing the consumption of northwestern box apples in Boston under private sale:

Season	Cars
1911-1912	370
1912-1913	365
1913-1914	354
1914-1915	360

It is evident that, although the crop of northwestern box apples has increased greatly, private sale has not been sufficiently flexible to widen distribution.

SPEED IN DELIVERY

One great essential in marketing fruits and vegetables is promptness in the delivery to the buyer. The private seller's ability to make prompt delivery is limited to the number of trucks owned or controlled by his boss truckman; but the auction method, with its immense volume, employs so many public truckmen for its daily work that it is at all times equipped to handle any quantity. For example, one hundred cars of California fruits — in addition to the other lines of different varieties selling — are sold and delivered in a single day, and have not overtaxed the capacity

of the auctions in one of our large cities. The more prompt the delivery, the more satisfaction to the buyer and the more he will pay.

AUCTION A COMING NECESSITY

The volume of the fruit and vegetable business has been growing so fast that it has become absolutely necessary for the growers to adopt the public sale system of selling. There is a point at which the system of private selling breaks down, simply because the machinery of the system is not adequate. When the production of a particular commodity is large, in order to get the best results for the grower there must be a concentration at one place of both the commodity and the buyers. When such concentration is possible, there is no question but that the auction system is the most efficient method of disposing of the product. It will not only increase distribution, establish the true market value by competition in bidding, perform all its operations in the full view of the seller — and is therefore better for the grower — but it saves the buyer's time (an important item in modern business) and helps the transportation company to move its tonnage speedily.

The auction system is adapted to the successful distribution of all fruits, vegetables, and farm produce. The call for it is greater today, because production has increased so much that a wider distribution has become an imperative necessity. Auction widens distribution and secures the highest market price for the grower, and this in his full view.

ONLY A FAIR TRIAL ASKED FOR THE AUCTION SYSTEM

To give the public sale system of selling produce a fair trial, a quantity sufficient to attract the buyer, including high-grade fruit, should be supplied to the auctions regularly. The large number of firms that deal exclusively in fruits sold at auction, being assured of a source of supply through this method, would welcome the opportunity to add other commodities to the list of those already dealt in. Buyers prefer the auction method of handling fruit because the sales are public. They then know what their rivals are paying for commodities and are on an equal footing with them. They can economize time. They can quickly

look over all the fruit in the market, select the sizes and grades wanted, and buy them if they are willing to pay the price.

Fair play is asked because a square deal is given. If only an occasional car of fruit that is far from its prime is offered at public sale, it will have a bad effect on the mind of the buyer and is not a fair test of auction methods.

The public sale, as was stated in the beginning, has been in successful use in Europe for one hundred years, and for fifty years in the United States. It is coming into use more and more; eventually every shipper will use it. The progressive man is he who grasps a good opportunity promptly. To wait is to lose a business opportunity worth using.

RECEIPTS AND PRICES OF APPLES IN NEW YORK CITY AND EXPORTS OF APPLES FROM UNITED STATES AND CANADA

H. B. KNAPP

Assistant Extension Professor of Pomology, Cornell University, Ithaca, N. Y.

Much attention is now being given to the marketing of farm products. It is well known that methods of selling and distribution have not kept pace with improvements in methods of production of such products. In no branch of the farming industry is this more true than in the culture of fruit in eastern United States. The problem is more serious, perhaps, to the fruit grower than to the grower of wheat, corn, hay, etc., because of the more perishable nature of this product and because fruit is not regarded as one of the staples necessary to existence, and is therefore subject to a fluctuating demand on the part of the public.

The fact that methods of marketing fruit in New York do not compare favorably with the methods pursued in Canada and the Pacific Northwest is no reflection on the New York grower. He was among the first to offer fruit for sale; his markets were at his doors and were ample to care for all that he could produce. It was natural that he should devote his attention to the growing rather than to the selling of his fruit. The industry in other sections is younger. It developed at a time when markets must be discovered and created — there were none waiting with open arms to receive the offering from these sections. It is also natural, then, that Canada and the West should have placed special emphasis upon the marketing side of fruit growing, for upon the opening of new channels for disposal of their products depended primarily the salvation of their industry.

The time has now come when New York must look to these same things if she is to maintain a position of prominence in the culture of deciduous fruits. If her growers sell their fruit at a profit in the future, it will not be because the consumer must have it, but because it compares favorably in all respects with the product of other sections. Fruit must no longer be picked

and sold blindly—it must be handled with intelligence and understanding. Fundamental to such an understanding is a knowledge of markets and market conditions—a broad conception of the entire marketing scheme as it is, and as it should be. The following charts and figures are designed to give a general view of the nature and importance of the New York apple market—the largest in the world.

The chart, Fig. 258, shows the annual receipts of apples on the New York wholesale market for the period from 1894-95 to 1903-04 inclusive. The reader, of course, understands that the

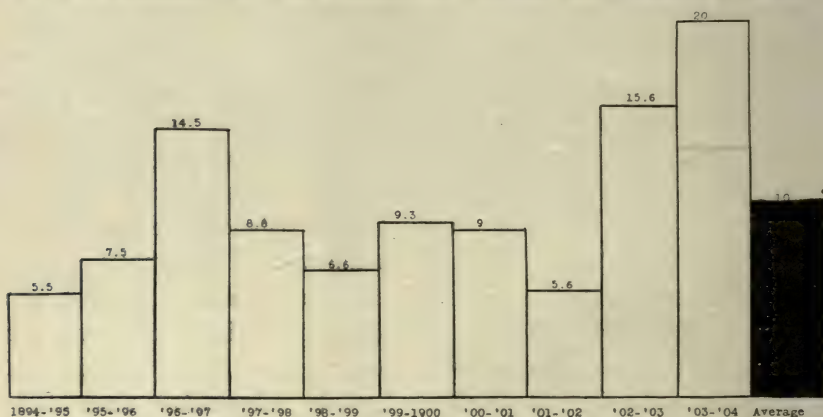


FIG. 258.—RECEIPTS OF APPLES IN NEW YORK CITY, FROM 1894-95 TO 1903-04, IN TERMS OF 100,000 BARRELS

apple season does not correspond with the calendar year; it begins in August and ends some time during the following July. These figures have nothing whatever to do with exports of apples; they represent the apples actually consumed in New York City or re-consigned to small towns and cities within a radius of perhaps forty or fifty miles. It is difficult to estimate just how extensive the reconsignment of apples is, but it is probable that it represents a considerable quantity of fruit, though a small percentage of the total receipts. The receipts vary from year to year with the crop in the country at large. The receipts in 1896 were 1,450,000 barrels. This is the year that many growers have good reason to remember. The average for the period was 1,000,000 barrels each year.

Fig. 259 shows the receipts from 1904-05 to 1913-14 inclusive. There has not been a year throughout the entire period in which the receipts were not greater than in 1896. The year 1912-13 was the most productive year that the New York market has ever known; 2,490,000 barrels were received, or about a million more barrels than in 1896. The yearly average for the entire period was 1,930,000 barrels, or an increase of 93 per cent over the previous ten year period — a most astonishing increase. Receipts during the season of 1914-15 were 1,965,000 barrels.

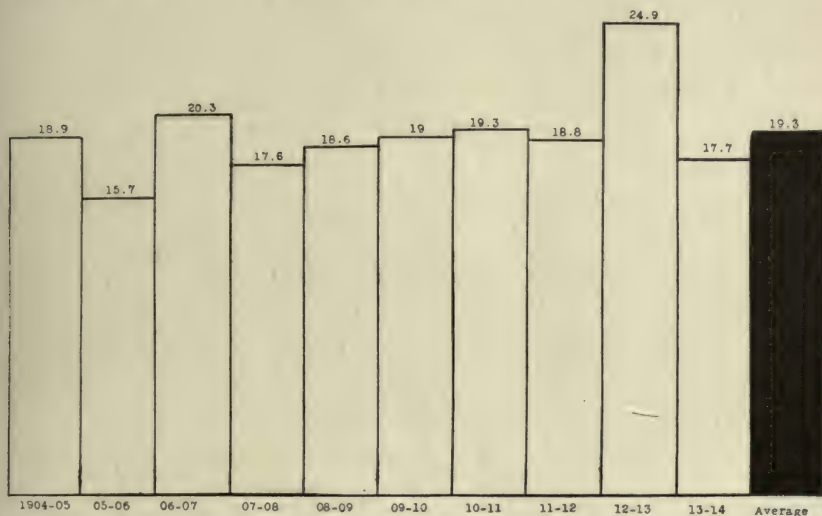


FIG. 259.— RECEIPTS OF APPLES IN NEW YORK CITY, FROM 1904-05 TO 1913-14, IN TERMS OF 100,000 BARRELS

Fig. 260 shows the percentage of the total receipts that go on the market each month. Receipts are heaviest in October and November, 41 per cent of the entire season's receipts reaching the market during these months and corresponding closely with the harvesting period of winter apples.

Fig. 261 shows the monthly prices of a barrel of Baldwin apples for the ten-year period from 1904-05 to 1913-14 inclusive. The figures are computed on a ten-year basis, because the prices for a single year or for a short period would mean little on account of the great variation from year to year in the production and supply of apples. The figures represent average prices, the

medium between the high and low ranges. The actual figures for the different months are of little importance, but the increase or decrease from one month to another is important. In general,

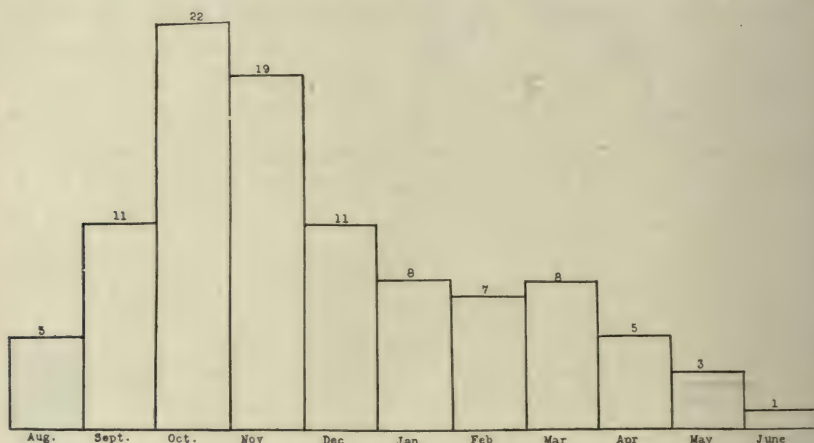


FIG. 260.—PERCENTAGE OF RECEIPTS OF APPLES IN NEW YORK CITY BY MONTHS — TEN-YEAR AVERAGE

this chart affords an indication of the advisability of holding Baldwins and what changes in price may be expected from month to month during the marketing season in years of normal crops

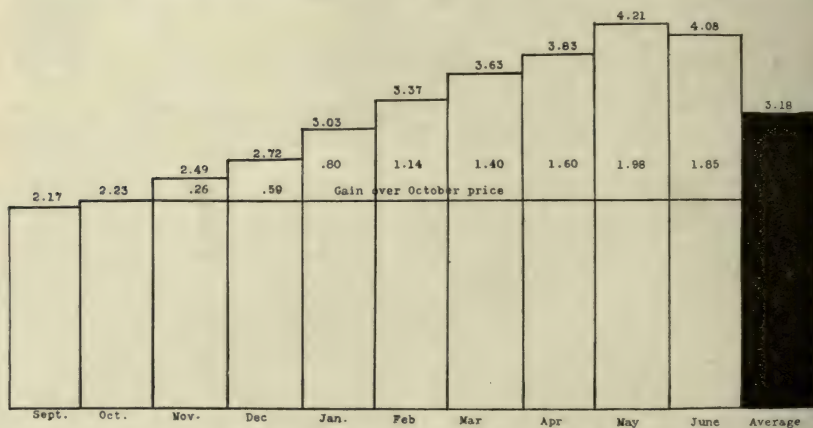


FIG. 261.—PRICE OF BALDWIN BY MONTHS IN NEW YORK CITY — TEN-YEAR AVERAGE

and normal business conditions. It is not expected that this chart would necessarily hold good for any single year; but for a series of years it should prove reliable in the majority of cases. Baldwin

is one of the most dependable market varieties grown in this state. The October price is rather low (poor stock being offered for the most part) but the price begins to rise at once, and continues to rise until May. There is scarcely a month in which the increase is not sufficient to offset the increased cost of storage, and the May price on the average is \$1.98 higher than the October figure. The ten-year average price of a barrel of Baldwins has been \$3.18; in 1914-15 the average price was \$2.48.

Fig. 262 shows the same thing for Rhode Island Greening. Greening is a good storage variety when carefully handled, but not so good as Baldwin, and in practice it should not be held so long. The ten-year average for Greening has been \$3.26; in 1914-15 it was \$2.62.

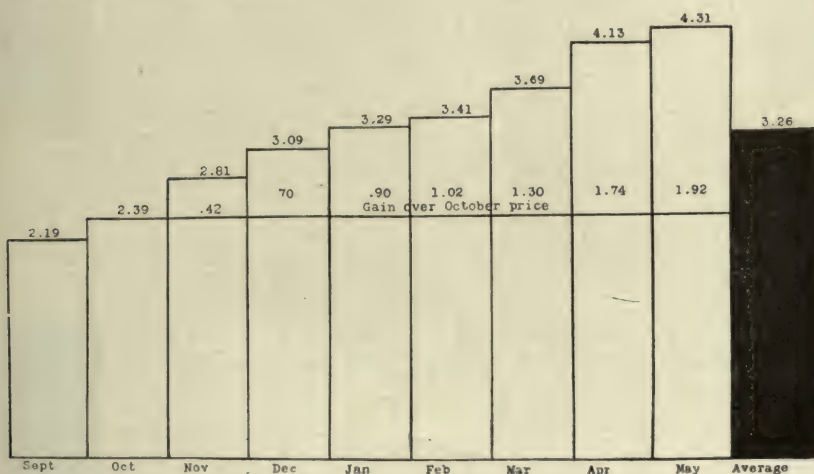


FIG. 262.—PRICE OF RHODE ISLAND BY MONTHS IN NEW YORK CITY—TEN-YEAR AVERAGE

Fig. 263 and Fig. 264 of Northern Spy and Tompkins King speak for themselves. Northern Spy rightly handled is a better storage proposition than Tompkins King; it is certainly better after February. Northern Spy has brought \$3.51 and Tompkins King \$3.24 as a ten-year average price. In 1914-15 the former brought \$3.31; the latter \$2.40.

Fig. 265 shows the monthly prices of Ben Davis. Ben Davis is a poor storage proposition during the first half of the marketing season; in the last half of it is a good one and continues to

become better the longer it is held. This corresponds with practice in handling this variety. Much has been said concerning the inferior nature of Ben Davis — probably all that has been said

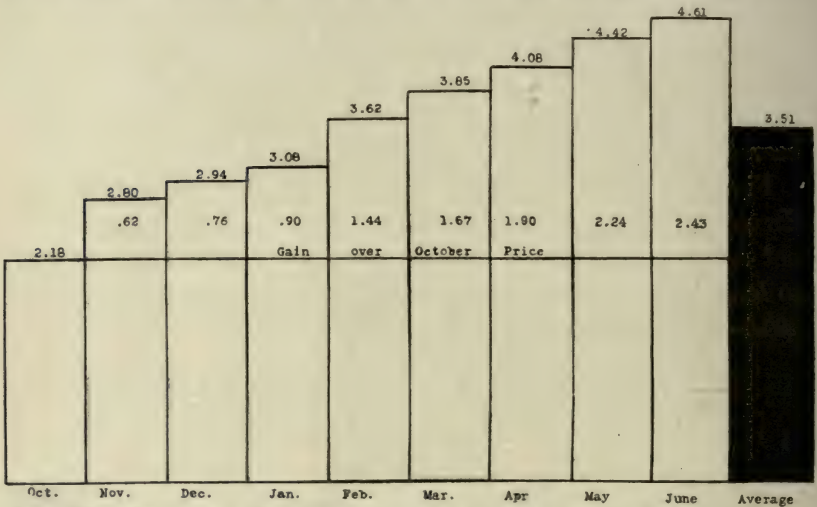


FIG. 263.—PRICE OF NORTHERN SPY BY MONTHS IN NEW YORK CITY — TEN-YEAR AVERAGE

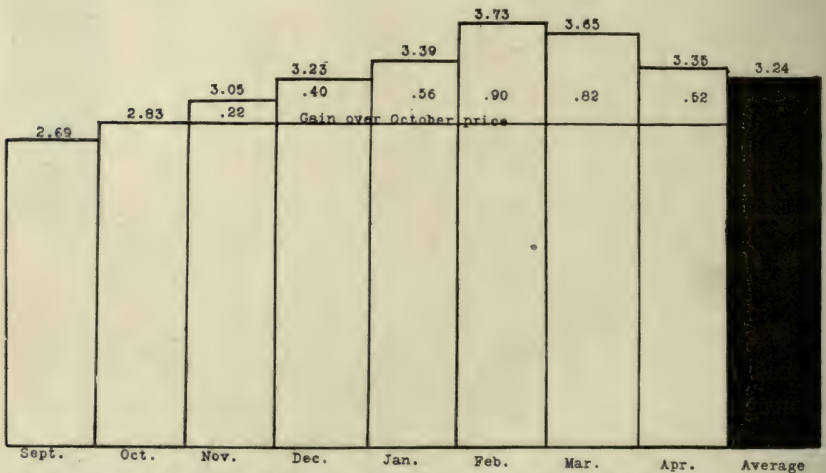


FIG. 264.—PRICE OF TOMPKINS KING BY MONTHS IN NEW YORK CITY — TEN-YEAR AVERAGE

is true; but, rightly handled, it is not a competitor of better varieties, and during the last part of the marketing season, when other varieties are off the market, it brings a higher price than

it ever did. It is difficult to convince a man that he should not grow Ben Davis when he has the money to show for growing it. The ten-year average price of this variety is \$3.03; in 1914-15 it brought \$2.04.

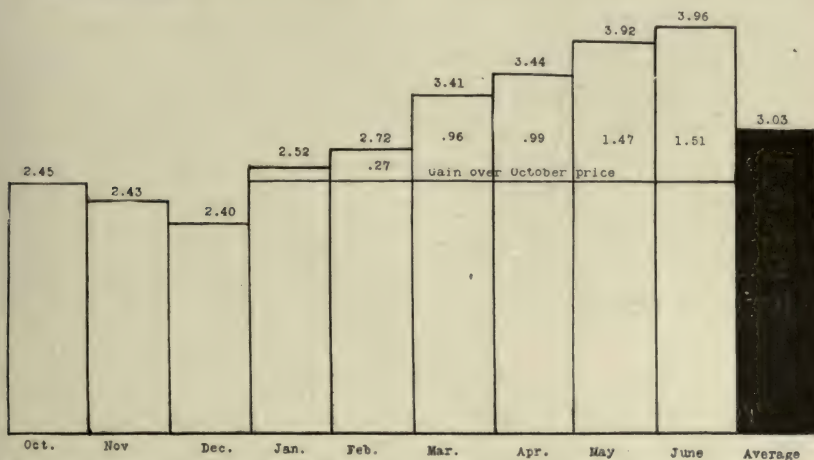


FIG. 265.—PRICE OF BEN DAVIS BY MONTHS IN NEW YORK CITY—TEN-YEAR AVERAGE



FIG. 266.—“FROM WHAT STATES DO YOU DRAW YOUR APPLES?” REPLIES OF 250 PRODUCE MEN

Figures have also been worked out for the fall varieties, such as Alexander, Twenty Ounce, Fall Pippin, McIntosh, etc. Almost without exception these figures indicate that the time to move these varieties is when they are picked — that they are not likely to pay for storage.

Some interesting information is displayed in Fig. 266. In 1914-15 a circular letter was sent to one thousand produce men in all parts of the United States. Among the questions asked was this: "From what state or states do you draw your apples to supply your trade"? Replies from 250 of these men were received in such form that they could be used and are incorporated in this chart. Some of the men gave a list of several states from which their apples came. New York was mentioned as one source of supply by 147; Virginia and Washington were second in popularity with 71 each. A considerable number of merchants stated that they would prefer to secure their apples from New York if they could depend on the pack. Apparently there is no prejudice against New York apples as such in home markets.

EXPORTS OF APPLES

The ports of this country from which apples are exported in commercial quantities are, New York, Boston and Portland, Me. Some Canadian apples are sent from Portland when the northern harbor becomes ice bound.

Fig. 267 shows the total amount of apples sent from these ports each year from 1905-06 to 1914-15 inclusive. Our exports vary with the size of our crop and with the size of the Canadian crop. Less than 10 per cent of the United States crop is exported, as a rule, while a very large part of the Canadian crop is sold abroad. Canadian apples are preferred in European markets, due to more complete standardization of the pack and better methods of packing. Our largest export year was in 1912-13, when 1,940,000 barrels left this country. The average for the period is 1,423,000 barrels. There was much talk in the fall of 1914-15 that apple prices must be low because there would be no export trade. Apple prices were low, but we exported more apples than usual — more than in any other year except 1912-13. This was because few of our apples go to Continental Europe. England takes practically all of them, and that class of English who purchase American apples seemed to have the money and the disposition to purchase them as in other years. Apple prices were low because of an unusually large crop, poor business conditions and uncertainty as to what the future might

bring forth, inability to obtain credit and disinclination to take chances, and because the dried apple markets were seriously affected.

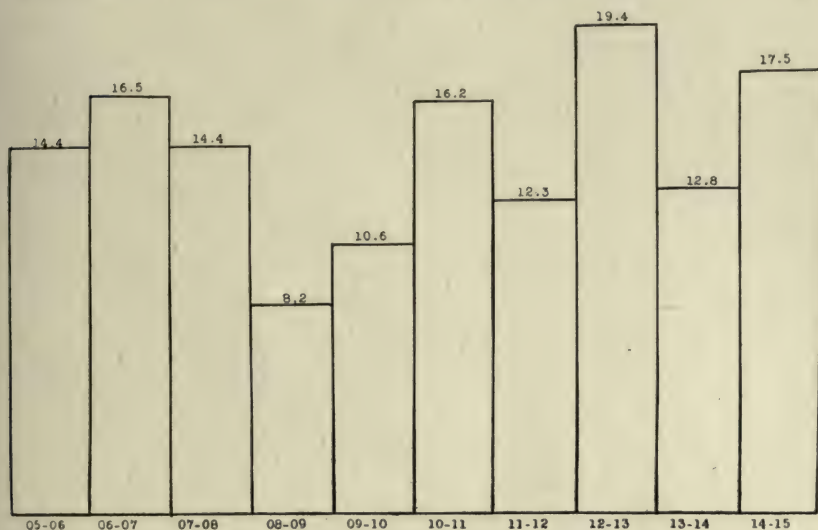


FIG. 267.—EXPORTS FROM UNITED STATES IN TERMS OF 100,000 BARRELS. AVERAGE FOR PERIOD, 1,423,000 BARRELS

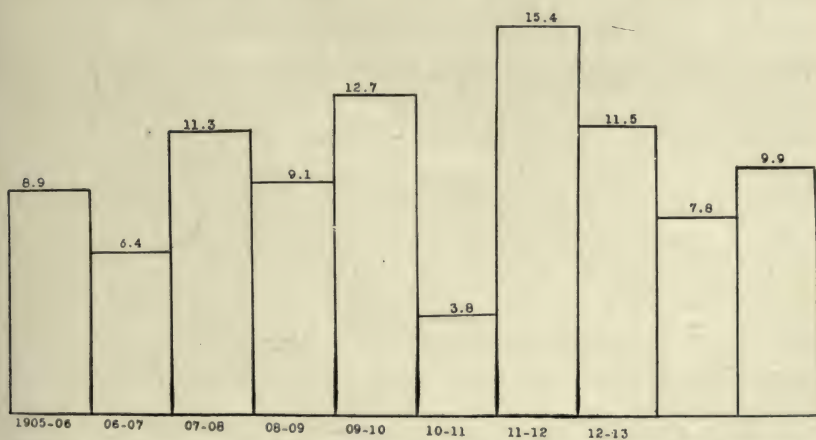


FIG. 268.—EXPORTS FROM CANADA IN TERMS OF 100,000 BARRELS. AVERAGE FOR PERIOD, 908,900 BARRELS

Fig. 268 shows Canadian exports for the same period; the ten-year average is 908,900 barrels. The Canadian industry is smaller and younger than our own, but is much better developed in regard to methods of packing and distribution.

Fig. 269 shows the more important importing cities of Europe and average annual imports of each. Liverpool, England, takes nearly a million barrels each year; London, England, takes 650,000 barrels; Glasgow, Scotland, takes 450,000; Hungary, Germany, takes 170,000 (the figures for Hamburg are computed on a nine-year basis; no apples reached Hamburg from this country in 1914-15). All other cities combined take 240,000 barrels.

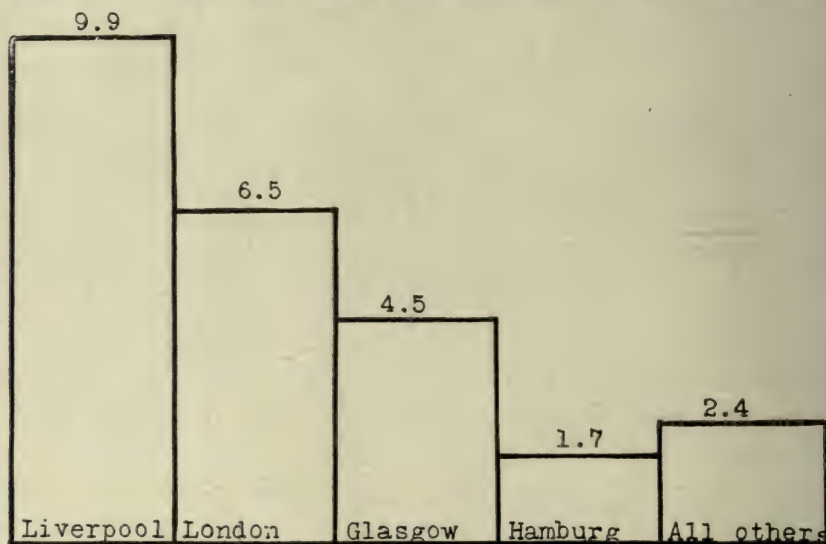


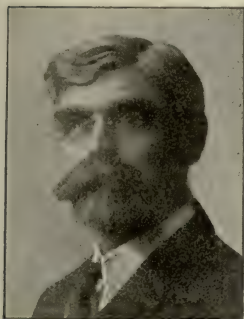
FIG. 269.—AVERAGE ANNUAL IMPORTS FROM 1905-6 TO 1914-15 IN TERMS OF 100,000 BARRELS

From the fact that Great Britain exercised control of the seas, it can be seen why our exports were not materially affected in 1914-15.

The most popular varieties for export are Baldwin, Yellow Newtown, Rhode Island Greening, Ben Davis, York Imperial, and Tompkins King. Russet, Winesap, and Northern Spy are also exported.

THE EVAPORATED FRUIT INDUSTRY IN NEW YORK STATE

E. W. CATCHPOLE, NORTH ROSE, WAYNE COUNTY, N. Y.

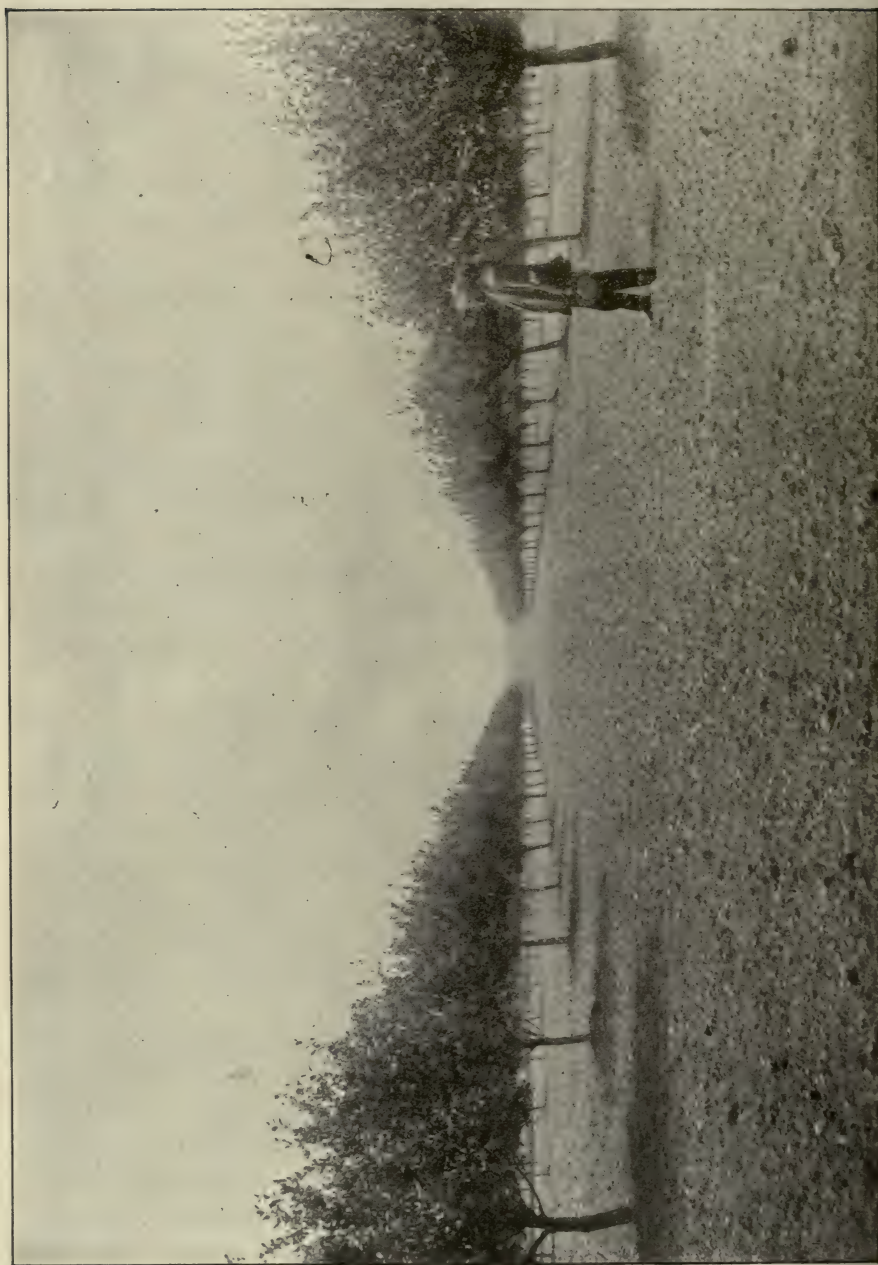


The evaporated fruit industry of the present day is the result of a gradual and normal growth, influenced by horticultural and economic conditions both in this country and in foreign countries. According to the Tenth Census of the United States, the total production of evaporated apples in 1909 was 44,568,244 pounds with a valuation of \$3,098,095 — this representing a four-fold increase in ten years. About 75 per cent of this product is made in New York State, four or five counties producing half this amount while the bulk of the industry is centered in Wayne County which had 2,200 evaporators in 1894.

EVOLUTION OF THE INDUSTRY—

Probably a few middle-aged men of today can recall the quarters of apples, with skin and core removed, that used to be strung up to dry over the kitchen stove. Then as fruit became more plentiful and both demand and price increased, this industry was transferred to the open; the quartered apples, properly prepared by paring, trimming, and coring, were spread to dry on boards about twelve inches wide and twelve feet long, which could be tiered or stacked up before a rain.

The next step in advance was the adoption of several forms of portable dryers. Then, as the large commercial plantings of apples came into bearing and prices of barreled apples ruled low with little demand for bulk goods, the tower and box commercial types of evaporator came into use. With large increase in available raw material, increased demand from Germany, and the strong German prejudice against the products made on metal racks wire-coated with zinc, the type of construction rapidly



turned to that of the hop kiln, and this practically holds the field today.

The earlier types of evaporator were situated on the farms, each having its own plant; but with the advent of larger types, the tendency to change to producing centers gradually increased. As a result, a few large capacity plants were built on the farms, but the labor problem, shipping facilities, and fuel supply favored locations in a village, and preferably a village near a railway, the latter plan appealing especially to the business man, who at this period came into the game and who as a rule was able to make a comfortable living, as he prolonged the evaporating season to three months.



FIG. 271.—ORCHARD OF E. W. CATCHPOLE & SONS, NORTH ROSE, N. Y. BEN DAVIS APPLES, TWENTY-THREE YEARS PLANTED. DISTANCE 35 FEET BY 35 FEET; 28 TREES IN ROW

APPLES SUITABLE FOR EVAPORATION

In earlier times the utilization of waste products was the principal object of the evaporated apple industry in order to save a portion of the crop in years of overproduction and low prices. As demand for high-grade products increased, however, with the ruling prices of picked apples in barrels and bulk lower, it was found

profitable in the average year to evaporate a better quality of apples and thus meet the demand of the trade for a high-grade product.

When apple crops are short and the resulting prices are high, only the lower grades can economically be used for evaporation.

The present season of 1915 ends with an unusual condition, for, owing to scarcity, the price of cider apples has advanced, and very large proportions of medium-grade apples and even wind-falls have been barreled, a large shortage for the purpose of evaporation being thus created.

PROCESS OF EVAPORATION

The process of evaporation consists in reducing the moisture content of the fruit by heating to a point where it will neither decay nor become sour, and will still retain its flavor and all fruit juices possible, 27 per cent being the legal state requirement. In the early stages a high temperature is desired in order to sear over the surface and so aid in retaining flavor and juices. Afterward the temperature is gradually lowered so as to reduce the moisture content to the desired amount.

The products of primitive methods are called "sun dried," or "dried," apples and are small in volume in this state; the commercial products are named from the practice, "evaporated apples."

EARLY HISTORY OF EVAPORATING APPLIANCES

The first of the appliance used was the cook stove attachment, consisting merely of a small galvanized iron box with trays for holding the fruit. It was used to a limited extent and only for a short time.

The second appliance on the market was the Topping portable evaporator. This patent was purchased by Mason L. Rogers, of Williamson, who built the first drier, made several changes, and finally sold it to Mr. Charles Topping, of Marion, who continued the manufacture to considerable extent. The evaporator was rectangular in form and was made almost entirely of wood. The racks were inserted from the sides, it had a furnace running lengthwise of the bottom under the racks and a ventilator extending the entire length of the roof-shaped top. Wood was largely used for fuel.

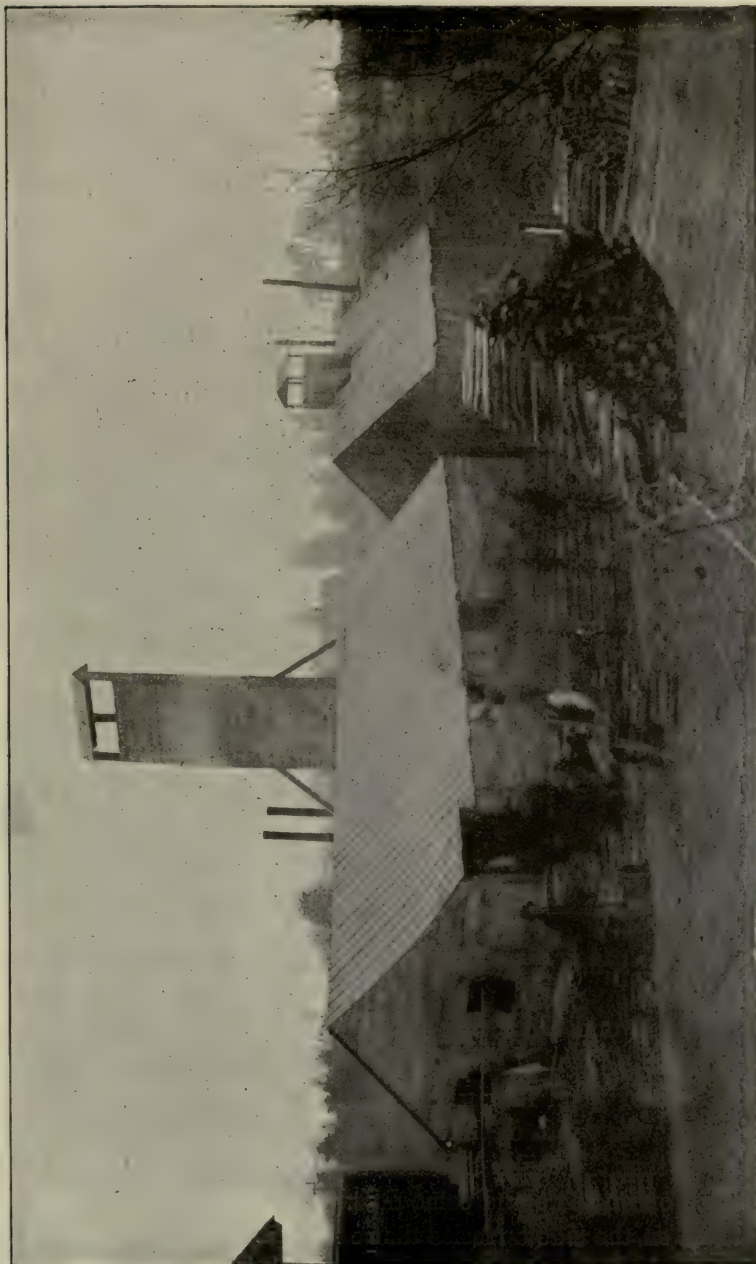


FIG. 272.—TWENTY EVAPORATING PLANTS, SIMILAR TO THOSE SHOWN, WERE OPERATED IN THE STATE OF MISSOURI, SEASON OF 1890, BY MEN FROM NORTH ROSE, WAYNE COUNTY, N. Y.

The size was $2\frac{1}{2} \times 3$ feet or $2\frac{1}{2} \times 3\frac{1}{2}$ feet, but this was later increased to produce twelve bushels per day of fifteen hours.

The Zimmerman patent came next. This differed from the Topping in being made entirely of metal. Its general principle was similar to that of the Topping, however, with the addition of a heat spreader to force hot air over the racks; its size was about $3 \times 3\frac{1}{2}$ feet.

MIDDLE PERIOD TYPES

The tower drier of the middle period consisted of an enormous brick chimney, usually entirely inside the building, extending from the cellar up through the two stories and roof and tapering after leaving the roof. The walls of the chimney were four inches

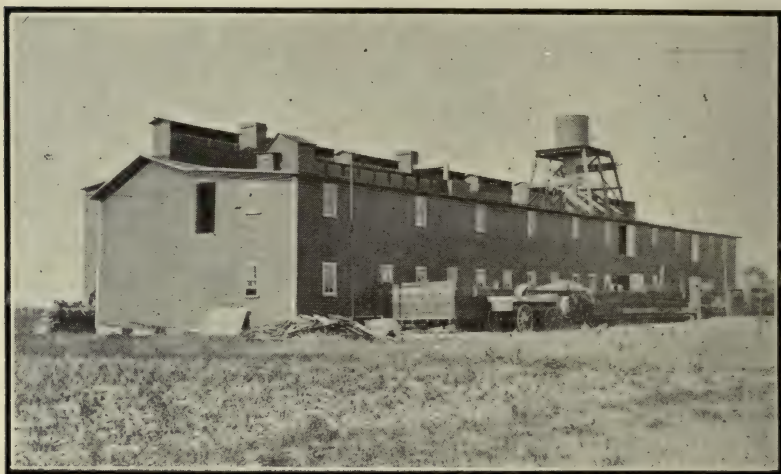


FIG. 273.— LARGE KILN PLANT AT SANBORN, ONTARIO COUNTY, N. Y.

in thickness, and there was an inside opening a trifle over four feet square. Wooden racks were used in this type of drier, the slats being of wood in some cases and of wire in others. Under one patent the width of the racks was about half that of the tower itself, so that the racks, attached to an endless chain of brackets, went up on one side and came down on the other, the fruit being removed on the side opposite that of its introduction. Under the other patent the racks were square, nearly the size of the inside of the tower, and were introduced into the tower on the first floor above the fire at a high heat (about 175 degrees). This entire

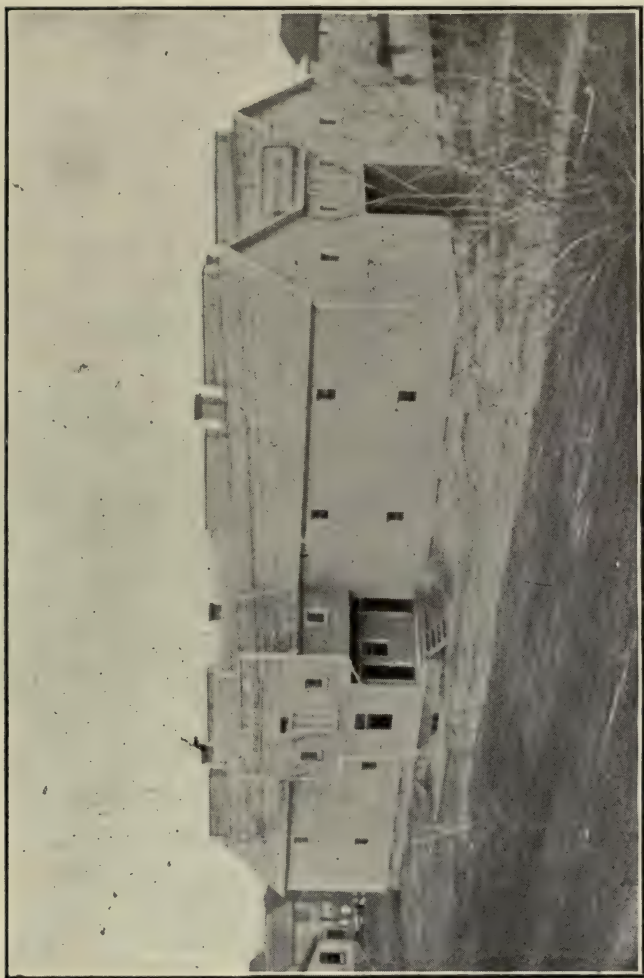


FIG. 274.—PLANT OF J. G. WRIGHT, WILSON, N. Y. EIGHT KILNS

mass of racks was raised, at regular intervals, by either a lever or a chain and sprocket arrangement. On arriving at the upper story the apples were dried, and there the racks were taken out. The capacity of each tower was approximately one hundred bushels per day. In 1876, Mason L. Rogers, who owned the first drier, built a tower evaporator on the Rogers homestead now owned by Willis P. Rogers, of Williamson.

The box drier consisted of a wooden box, 4 feet wide, 7 feet high, and from 16 to 20 feet long on the inside, which usually stood on the first floor of the evaporating plant with one end over

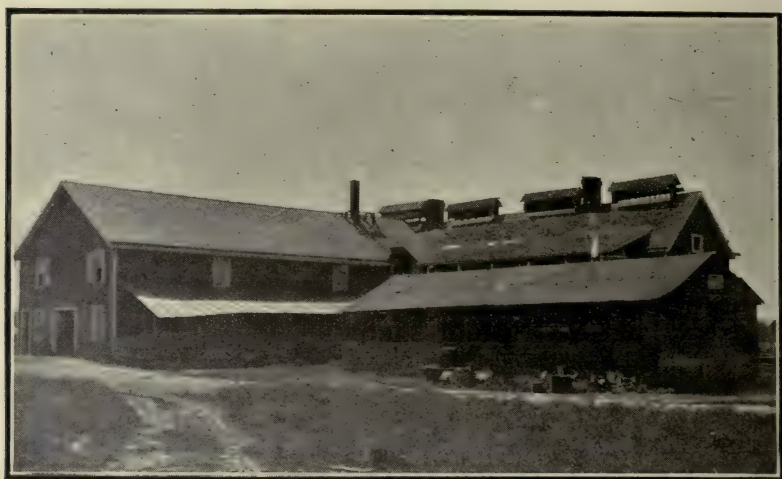
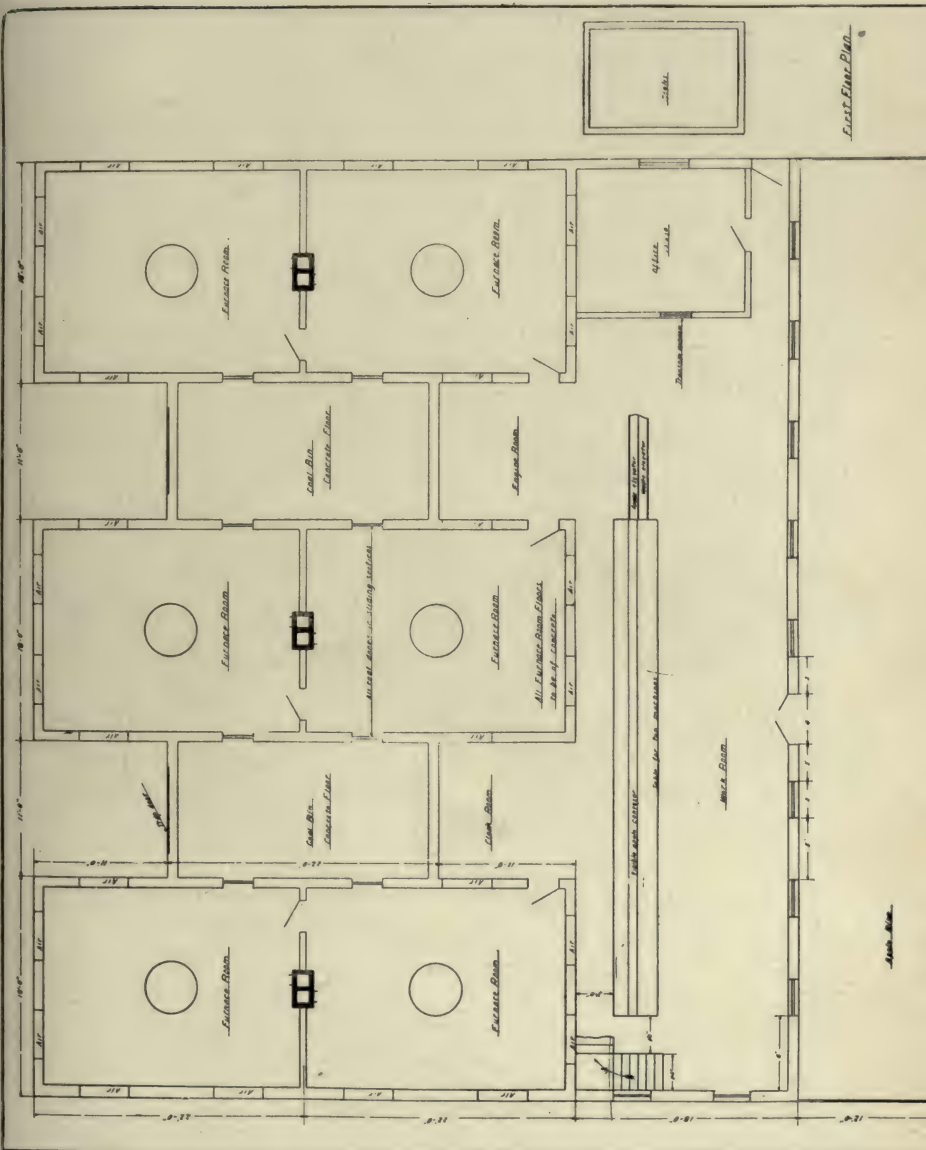


FIG. 275.—FOUR-KILN PLANT. WORKROOM ATTACHED AT RIGHT ANGLES

the furnace. Two pipes extended the whole length of the box underneath the racks and at least three feet below them. At the end of the box they turned, were led back, and disappeared into the chimney at the middle of one side. These racks were supported by cleats running the entire length of the box on the inside, in rows which were about six inches apart and which were called "runs." After being spread with the green fruit, these racks, which were made of a wooden frame and quarter-inch wire mesh, were introduced at the lower end of the box directly over the furnace in order to sear the fruit with a strong heat. At regular intervals additional racks were introduced by those in charge, the operator at the farther end from the furnace taking out a rack and inserting it in the run above and thus making room for

EVAPORATED FRUIT INDUSTRY IN NEW YORK STATE



First Floor Plan

the introduction of another rack over the furnace. By means of this process the racks sent forward on the lower run returned on the one above it, and the operation was continued until the upper runs of the box were reached, where the temperature was much lower. By this time the fruit was properly dried.

The steam type of evaporator differs from the box in that the source of heat is centered in coils of steam pipes between every second row of racks, making it necessary to have additional space between the pipes and racks immediately above so as to prevent the fruit from being burned directly over the steam coils. The advantages of steam are: A better quality of fruit product and a saving in cost of fuel, since a cheaper grade of coal may be used. It is disadvantageous in that more labor is required in operation, and, besides the high initial cost of the pipes, renewal is necessary every two years. Four thousand feet of one-inch steam pipe represents capacity for three hundred bushels per day.

LATER PERIOD TYPES

First, the hop kiln. The hop kiln requires a building with a fairly steep roof, usually constructed with 16-foot standing, and square or nearly so, the popular sizes being 18 x 18 and 20 x 20 feet. A very large furnace with generous heating capacity is placed in the center of the building, and at the roof point a good-sized ventilator is located for the purpose of allowing steam and moisture to escape, the openings being fitted with doors that may be regulated by ropes and pulleys in order to control the steam escape according to the direction of the wind.

In the standard two-kiln type, the kilns are 20 x 20 feet and a two-story workroom is attached the entire length of one side. Paring machines and conveyors are on the first floor from which the apples are elevated to the second floor into the bleacher. From there they pass the slicer and thence by conveyors (in the case of a power plant) into the kilns.

The kiln floors are constructed of strips of either maple or basswood, one inch wide on top, seven-eighths inch thick, and one-half inch wide on the under side, and laid with a quarter-inch opening at the upper edges; the wider space at the bottom prevents the lodging of small particles of the dried fruit. These floors are

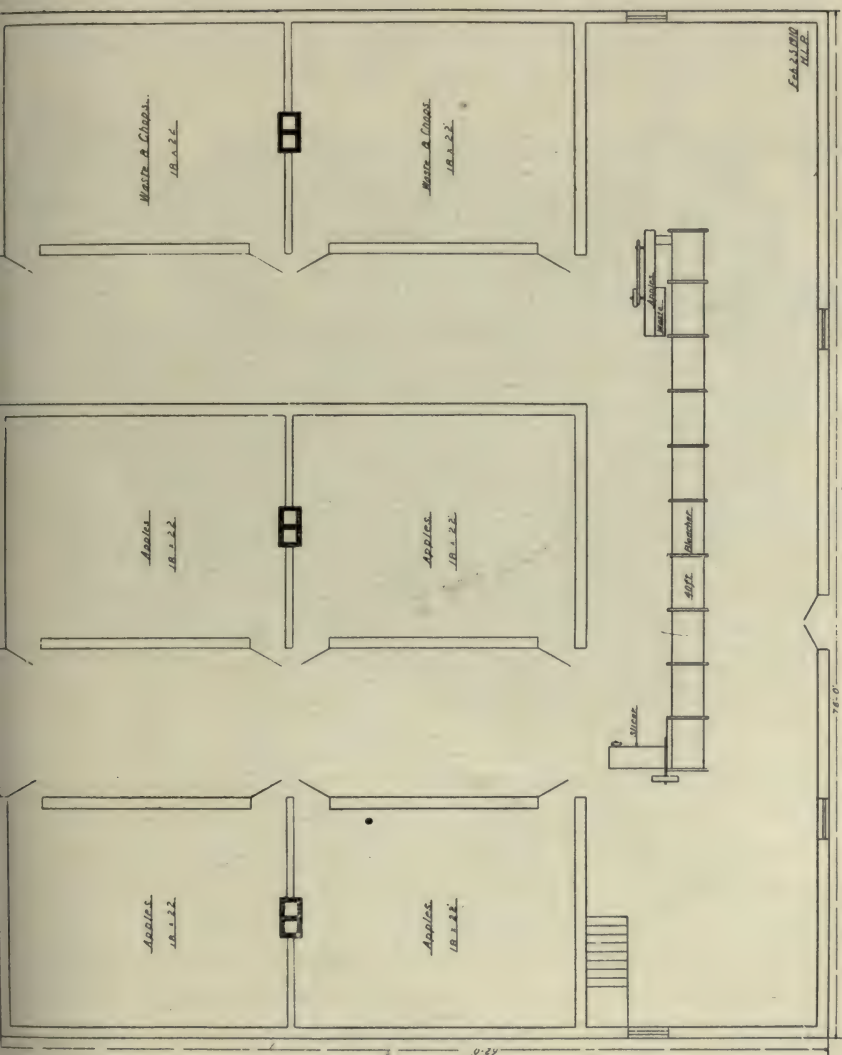


FIG. 277.—SECOND FLOOR PLAN OF SIX-KILN EVAPORATOR, SHOWING BLEACHER

oiled before using and at regular intervals during the evaporating season in order to prevent the fruit from clinging to them. These openings allow the heat to pass up through the fruit from the furnace room below. Openings are also included in the furnace room for the purpose of admitting and controlling the cold air so as to maintain the desired temperature in the kiln.

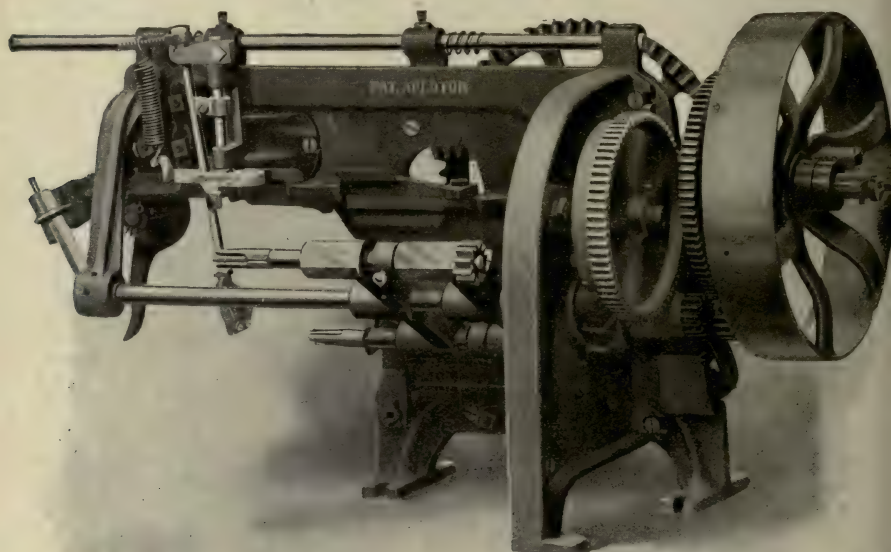


FIG. 278.—TRIUMPH POWER PARER, MANUFACTURED BY THE BOUTELL MFG. CO., ROCHESTER, N. Y

The usual method of piping is attained by the extension of two parallel rows of pipes from two openings in the top of the furnace to a point a foot and a half from the outside wall, where the pipes turn at right angles in opposite directions, are led around and enter the chimney at the side opposite the furnace. In later years several plans of double piping have been used successfully, resulting in a more uniform distribution of heat and economy in fuel.

MACHINERY AND APPLIANCES

Apple Graders

The cheaper and smaller types of apple graders used in packing apples are also used for removing small apples from the raw

material before it is sent to the paring machine. The apples under two inches in diameter are used either for chops or for cider.

Paring Machine

The automatic hand-paring machine that performs the operations of paring, coring, and slicing, is still used in many farm plants and in a few of the commercial ones, but is to a very large extent being superseded in the plants operated by business men. by power-paring machines, and in some cases by automatic self-feeders.



FIG. 279.—SLICER MANUFACTURED BY THE BOUTELL MFG. CO., ROCHESTER, N. Y.

Bleachers

In the large power plant, the operation of bleaching is usually accomplished on an endless belt as it passes through the bleaching box. This box is approximately three feet square in cross section and of sufficient length to give capacity for the completion of the process as the fruit passes through.

When the other type of bleacher is used the sliced apples, contained in bushel boxes with slatted bottoms, are passed over the rollers in the bottom of the bleacher box, being advanced at regular intervals until the process of bleaching is completed after the length of the box has been traversed.

In both of these types, the sulphur burner that generates the sulphur for their process is located at the end where the fruit is introduced.



FIG. 280.—RINGS OF FANCY EVAPORATED APPLES

Furnace

It is necessary to have a furnace of generous capacity, with a very large fire box especially manufactured for this purpose.

The open furnace with heat deflector overhead, which was employed to considerable extent a few years ago, is but little used

at the present time. One objection to this type of furnace is that the dust created makes it impossible to produce the higher grades of fruit.

Racks

The prejudice of the German people against fruit dried on zinc, or zinc-coated, racks was overcome for a time by the use of racks with wooden bottoms, especially in the tower type evaporator. This objection is now avoided by using the kiln type evaporator, with floors of wood.

Fuel

Wood, hard coal, soft coal, coke, and natural gas are used for fuel. The sulphur fumes from the coal are an aid to the bleaching process. In kiln evaporators the combination of coal and coke gives the best results.

MARKETS

Domestic

In the early seventies, W. T. Gaylord, sr., sent a load of dried apples to Jefferson County by team and exchanged it for a load of cheese. This is the first known commercial transaction in dried fruit in New York.

In the early days the domestic market east of the Mississippi river gradually increased in volume and territory, extending to the south, south-west, and north-west. During the past few years, however, California has taken over the north-west trade, owing to the fact that her product contains less moisture and hence has a better keeping quality, although it is at the same time handicapped by lack of flavor.

Canning has hurt the domestic market but not the export business. Canned apples are not desirable for pie bakers, owing to their lack of flavor; 30 per cent of pie-bakers' requirements of fruits and berries are carried in the frozen state.

Export

Early in the seventies, David Wing & Brothers worked up an export trade and opened branches at both Clyde and Wolcott, Wayne County, New York. It was not until 1890, however, that the export market was inaugurated by a few Chicago firms,

although within a few years it came into the hands of New York City dealers. Next came the advent of the brokers in cities, and from 1907 to 1910 the volume of business largely shifted from the cities to Rochester, New York, where a system of trading between local dealers was initiated as a result of the efforts of one or two brokers. The crop is now sold five to eight times over in a speculative way, owing to the ease of obtaining reliable information on probable crop conditions as early as January in any given year.

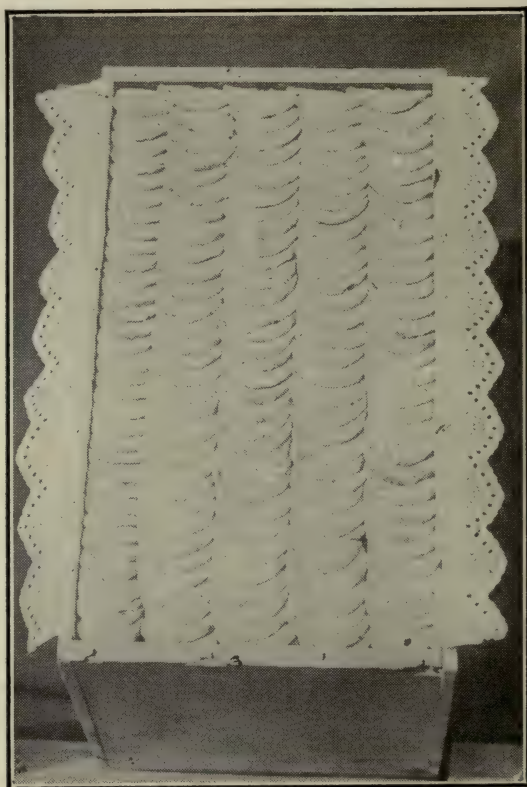


FIG. 281.—FACED END OF BOX OF FANCY EVAPORATED APPLES.

We have a small business with South America and South Africa, but the large bulk of our export business is with Germany. One German importer alone increased the volume of his business from thirty to forty cars in 1893 and to two hundred cars in 1905, and

says: "I believe my competitors were able to increase their business in the same way." By following an educational campaign in Germany, candy and jelly makers were persuaded to substitute high-grade evaporated apples for fresh apples, with the result that consumption increased until the quality of the product was lowered as a result of speculation in our American markets.

BUDDING AND GRAFTING

Nay, you shall see mine orchard: where, in an arbour, we will eat a last year's pippin of my own grafting. . . .

SHAKESPEARE'S HENRY IV.

GRAFTING AND BUDDING

DR. GEORGE G. ATWOOD

Chief, Bureau of Plant Industry, State Department of Agriculture, Albany, N. Y.

The practice of grafting is one of ancient origin, but the main purpose to which it is applied is not materially different today from that of early times. The chief object is to change seedlings or useless stocks of trees to desirable or more valuable varieties.

Very few seedling or natural trees produce valuable fruit, but they can be used for unlimited propagation of choice varieties. The scion holds within its buds the potential character of the new top in variety of fruit, foliage, and hardiness. Even a scion of a sweet fruit grafted on a stock always sour will bear fruit the same as the scion used.

TOP GRAFTING

Top grafting, as distinguished from root or crown grafting, refers to the practice of working over bearing trees for the purpose of changing variety, increasing production, and hastening bearing age.

Top grafting is done only in the early spring. The scions to be used should be cut, selected, and carefully stored before the extreme cold of winter. Scions of the preceding summer's growth are used. Choose only mature, well-ripened wood about $\frac{1}{4}$ to $\frac{5}{8}$ inch in diameter, with prominent buds. Tie loosely in small bundles with cord, and pack in old sawdust and sand. Scions must be kept just moist enough to prevent shriveling, and should be kept cool in order to delay starting or swelling of the buds.

Very old or waning trees are usually not valuable for top-working. Only vigorous or healthy trees should be operated upon, though large trees, if sound, may be changed over in two or three years by grafting a part of the top each year, but this is primarily a pruning problem and not essentially a grafting one. In top grafting the splice or tongue graft (Fig. 282) is used when the stock and scion are nearly the same size; but when the stock is considerably larger than the scion, then the cleft or wedge plan (Fig. 283) should be adopted. In the latter, the stock is

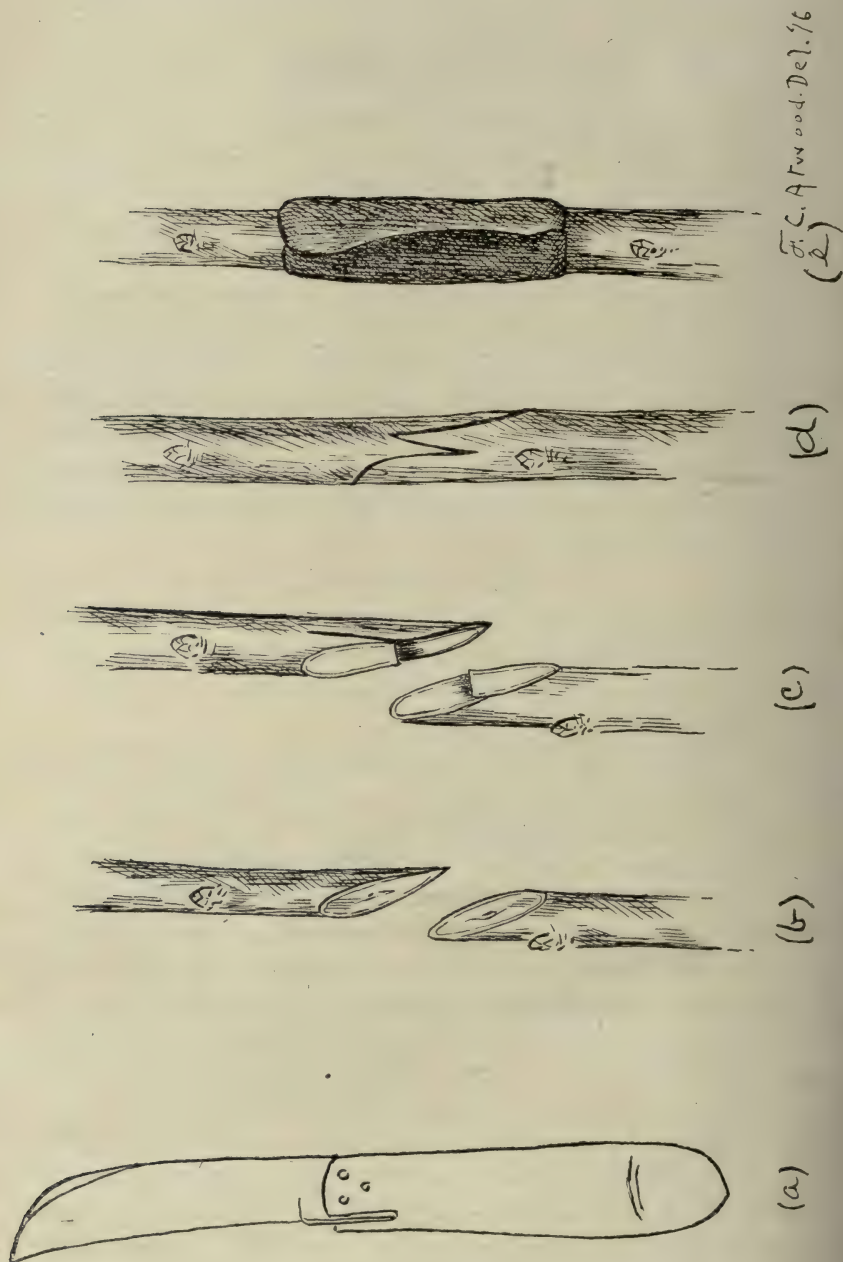


FIG. 282.—SPlice OR TONGUE GRAFTING

first cut in the healthy portion of the branch, the future shape of the top being kept in mind, as in pruning. The cut should be made with a fine-tooth saw and the bark kept free from injury. The stock is split downward; a wedge may be used to hold the cleft open until the scion is placed in position. Care should be exercised that the outer bark of the stock and the scion come together, as shown in Fig. 283 (d).

The scion should be from 3 to 5 buds long and should be cut wedge-shaped (Fig. 283 [c]), with one edge slightly thicker than the other. The object is to have the pressure of the cleft, after the wedge is removed, greatest upon the outer side (Fig. 283 [d]) where the growing union is to be effected.

If the stock is large, say 2 inches in diameter, two scions may be placed in the cleft opposite each other. When the wedge is removed, if the scions are not held firmly, the stock should be tied with cord or tapes before waxing. Wax may be applied in liquid form, or as plastic wax (Fig. 283 [e]); or waxed tape may be used in splice and tongue grafting, thus uniting the strength of a cord to the covering process.

Every cut or opening, including the upper end of the scion, must be carefully covered with wax to prevent evaporation and to insure growth. All joints must be kept air tight. Extreme heat or cold may cause the wax to shrink. It is therefore well to look over the work occasionally.

ROOT OR CROWN GRAFTING

Root or crown grafting is very generally used by nurserymen. One- or two-year seedlings are stored in cellars for grafting in the winter. The splice or tongue method is used.

Apples are grafted at the collar or crown, or on pieces of the root. The root may be from 3 to 6 inches and the scion from 2 to 4 inches, but the completed graft should be not over 8 or 9 inches. The union is made firm by tying with string or waxed cloth and applying liquid wax. Grafts are then packed in sand or sawdust and kept moderately moist in a cool cellar, ready for dibbling in the early spring. Apples may be grafted on whole or piece roots; pears only at the collar on whole roots.

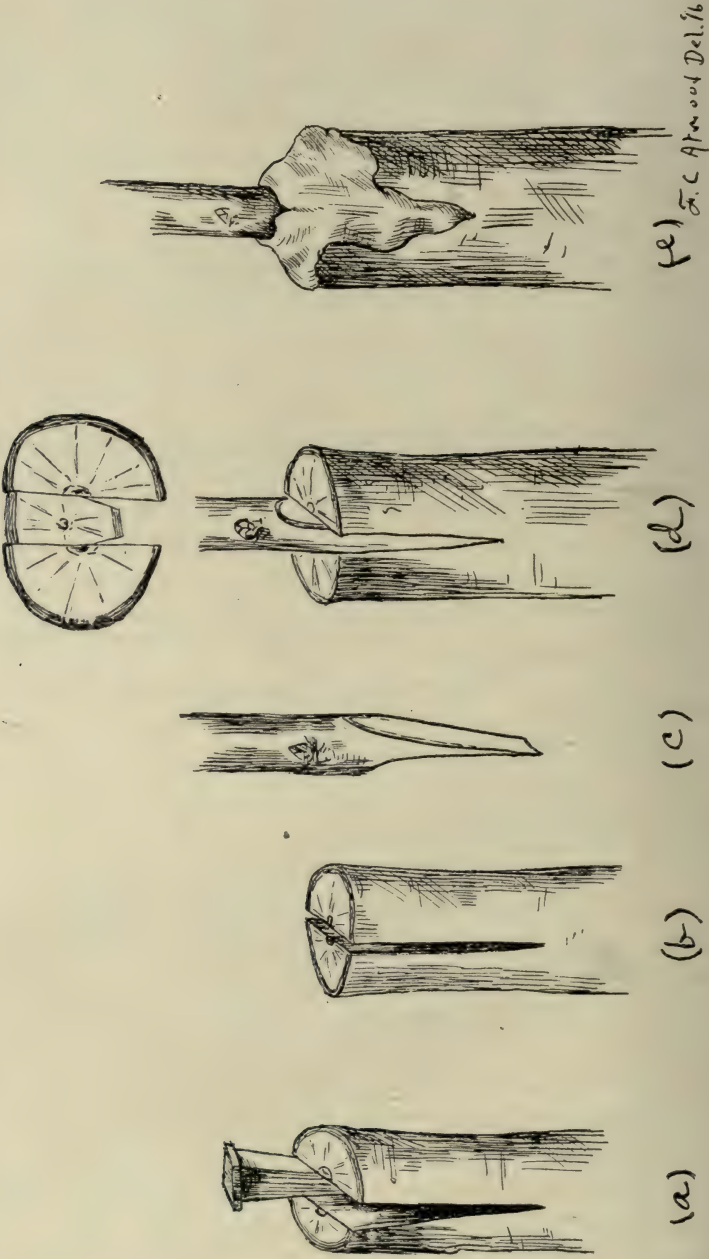


FIG. 283.—CLEFT GRAFTING.

BRIDGE GRAFTING

Bridge grafting is a modified form of cleft grafting and is often used to repair damage to trunks of trees when the bark has been injured or removed by rabbits or mice. The process may be used for inarching to supply added strength to branches, to bridge over wounds caused by broken limbs, or where blights and cankers have been cut out.

Before bridging, the exposed wood should be painted with thick linseed oil paint. Scions previously collected should be inserted as shown in Fig 284 (b) and (c), and they should be carefully waxed as in cleft grafting.

GRAFTING WAX

For outdoor or top grafting a grafting wax made of the following is recommended: 4 pounds resin, 1 pound beeswax, 1 pint linseed oil. The wax should be melted. If to be used in plastic form, small portions of the hot wax must be poured into a bucket or pulled into pliable strips. If, however, the wax is to be applied hot with a brush, it may be heated in the field with hot water or over a portable heater, such as an oil stove.

Waxed tape or string are prepared by dropping small balls of either into hot wax and leaving for a few moments.

Grafting wax for indoor work may be made as follows: 6 pounds resin, 1 pound beeswax, 1 pound mutton tallow or 1 pint linseed oil. When heated to a temperature of 175 degrees F. apply with a brush.

BUDDING

While grafting is usually done in the dormant or early spring season with the use of only dormant scions, budding is ordinarily done in the summer or fall when the stock and bud sticks are in growing condition.

The exact time to bud is when the stock will peel; that is, when the bark can be carefully lifted, and when bud sticks of the current season's growth of proper maturity can be secured. Bud sticks are selected and the leaves are at once cut as shown in Fig. 285 (b). The way to cut the bud is shown in Fig. 285 at (c). A cross cut is made just through the back of the stock and then a down cut is made. The points or corners are carefully raised

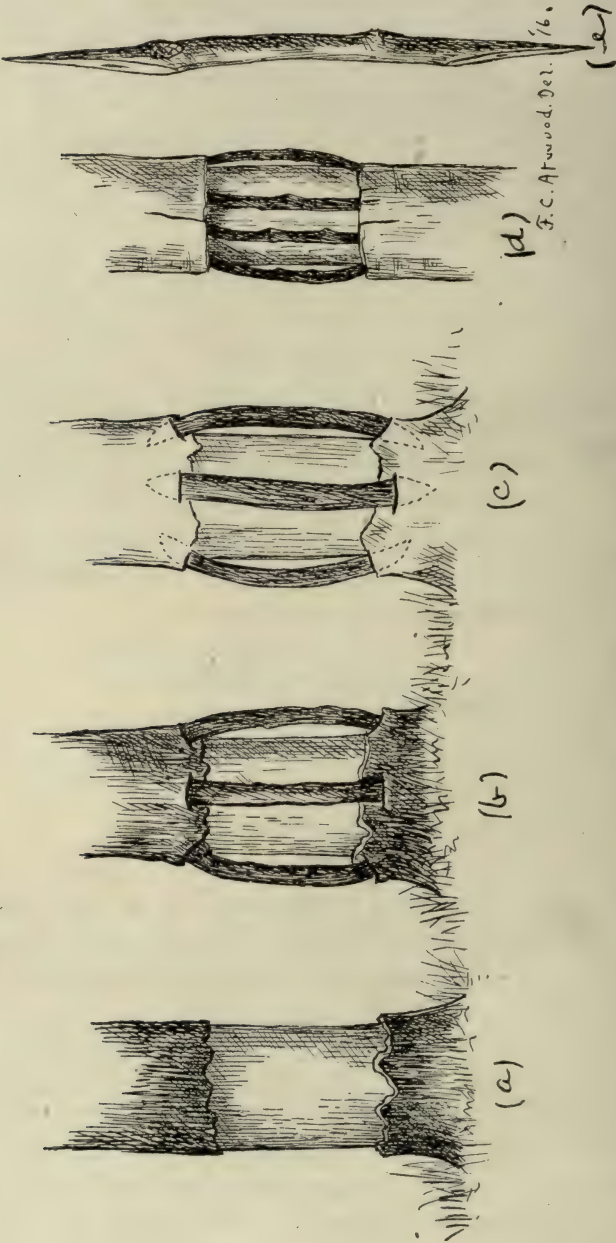


FIG. 284.— BRIDGE GRAFTING

and the bud inserted between the wood and inner bark (Fig. 285 [d]). Tie carefully as shown in Fig. 285 (e), being sure to have all unions unscratched and tight. No wax is used.

In two or three weeks the union will be perfected and the tie of raffia or string must be removed to prevent girdling. The buds thus inserted remain dormant until spring. Before growth begins, the stock or upper portion must be cut off about one inch above, and all growths other than the one bud should be kept from growing by frequent sprouting.

OTHER METHODS

It would require another chapter to describe the many other forms of grafting, budding, and combinations of each, with methods of propagation in use by skilled nurserymen, tree growers, and plant breeders. These lines are intended only to define methods for the use of the orchardist, yet it may be of interest to make a note of a few forms in use.

Crown Grafting. Where stocks are heavy, say four inches or more, numerous scions are inserted in V cuts around the stock.

Saddle Grafting. Where the scion is shouldered and fitted upon the stock.

Peg Grafting. Similar to cleft grafting. The scion is sharpened and inserted in an auger hole.

Inarching. Where a grafted union is formed by uniting the branches of two different trees, and separating after wounds have healed.

Insert Grafting. A green or a dormant scion is budded into a growing plant.

Flute or Ring Budding. A ring of bark containing a bud is fitted into the space where a similar ring has been removed.

June Budding. As soon as a stock will peel, buds are cut from scions previously preserved. As soon as the union is complete the top is cut and the bud forced out. This is the way to grow the June budded peach, but is not practicable for other trees.

Statements by ancient authors that vines are grafted on fig trees, apples on planes, etc., are not to be credited.

For practical purposes and for commercial use, it must be borne in mind that the stock and scion of the same or very nearly

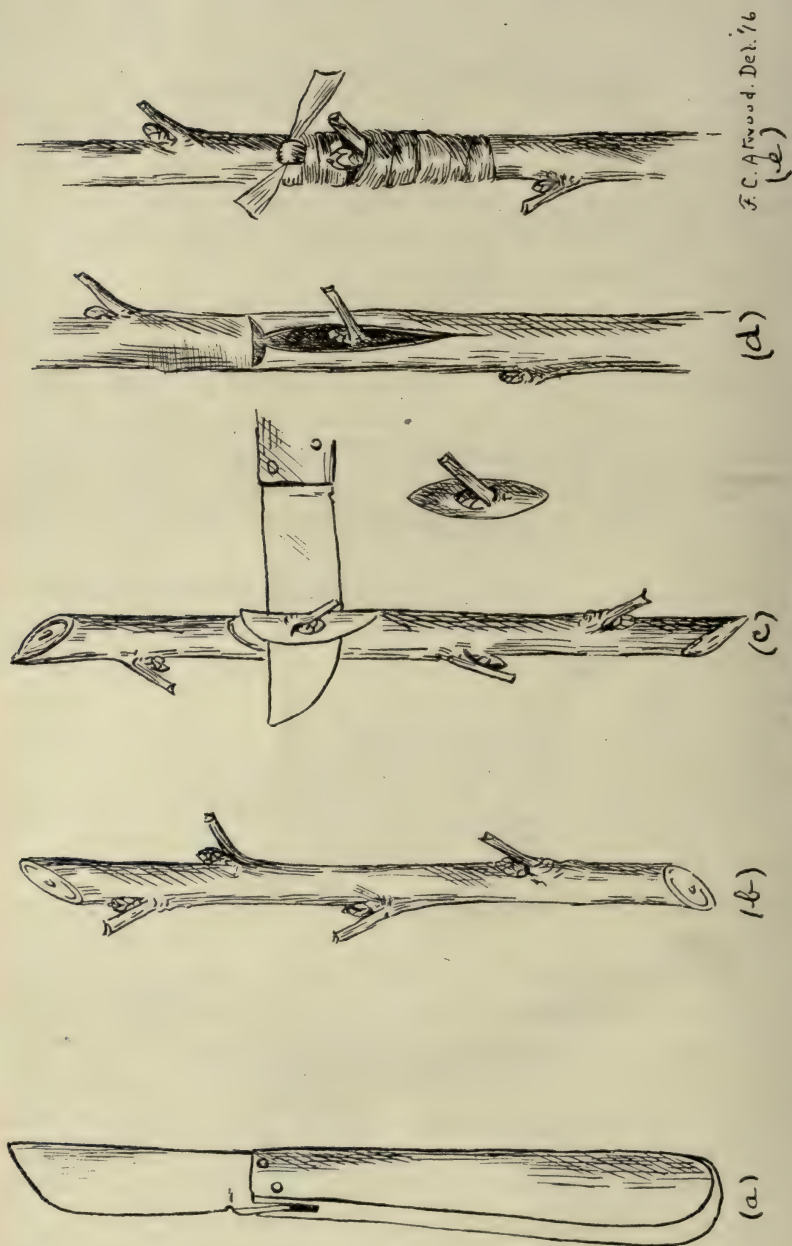


FIG. 285.—BUDDING

related species are to be used. All attempts at grafting fail except among plants of the same genus or of the same family.

NOTES ON GRAFTING AND BUDDING OF OUR ORDINARY FRUIT TREES

Apples. All varieties make good union on all other varieties and upon the common or seedling apples.

Dwarf apples are produced by budding on Paradise or Doucin bush species. Apples do not thrive worked on crab.

Pears fail if worked on apple stocks.

Varieties of pears interchange on other varieties, except Keiffer is not an approved stock on which to graft Bartlett, Bosc, Seckel, etc., but Keiffer does well grafted on Bartlett and other varieties.

Dwarf pears are common varieties budded on Angers quince stocks, but fail if budded on Orange.

Keiffer is not a permanent dwarf.

Dwarf pears are best if only varieties having large quince-shaped leaves are united.

Plums. Japan sorts make good union on Myrebolan stock and on peach. The former live longer.

European plums are usually worked on plum stock. They partially fail on peach stock.

The peach thrives best on peach stock dwarfs and fail on plum stock.

Cherry. Sour types thrive on Mahaleb stock and on Mazzard, but sweet types are best on Mazzard.

GRAFTING OF GRAPEVINES

Scions made from wood of the preceding year's growth are selected and cut as illustrated on page 960 for cleft grafting, or on page 958 for tongue grafting. Cleft grafts are inserted when the stock is — say larger than one inch in diameter; and tongue or splice grafting is done on branches less than one inch, or as small as the diameter of the scion.

Grafting of grapes should be done as early in the spring as the soil can be taken away from the stock. The scion should be set just underground, or low enough on the stock to permit covering or banking to the top bud of the scion. Grafting, however, may be performed on an arm of a vine at such a point as will permit

of bending the branch to the ground, where it can be laid low and covered with a mound of earth. Grapes cannot be successfully grafted and left above ground, as can tree stock. They must be buried or mounded as indicated.

For grafting grapevines the following cheap and easily prepared substitute for wax may be used: 1 peck of clay; $\frac{1}{2}$ peck of fresh cow droppings. Moisten and thoroughly mix; add a handful of hair, such as is used in mortar, or even a handful of short grass may be used if hair is not available.

Grapes are never budded. In connection with grafting grapes note matter on pages 957 and 959 relative to selection of scions, method of cutting, and also that with reference to proper tying of the stock to hold the scion firmly in place.

PHYSICAL INJURIES TO TREES

B. D. VAN BUREN

Assistant Chief, Bureau of Plant Industry, State Department of Agriculture,
Albany, N. Y.

The meadow mice and cotton-tail rabbits throughout the state, and the jack-rabbits in the Hudson valley, cause serious injury usually to young trees. If trees are mounded eight or ten inches high with earth in the fall, and the mounds are steep, but few mice will climb the mounds and girdle the trees. Wood veneer sheets or tarred paper protectors, if properly placed, will protect the trees from injury. Both of these should be removed during the summer and replaced in fall or early winter. Fine screen galvanized wire, $\frac{3}{8}$ -inch mesh, one foot high, is effective in protecting against mice, and, if higher, is also effective against rabbits — but is quite expensive. For rabbits alone, guards three feet high made from one-inch mesh galvanized chick wire are very effective and not extremely expensive. These can be put on when trees are planted and left for six or eight years. Use the one-foot high wire and cut to the desired length. This gives a cylinder four inches in diameter and will furnish protection against rabbits about as long as needed. Concentrated lime sulphur has been quite effective as a repellent and has been used extensively. At least two applications must be made each season: in November or early December at the first sign of injury, and again about February first. This in the long run is fully as expensive as the protectors and not so safe. In case of very heavy snows it might be necessary to paint the trunks and branches above the protectors with lime and sulphur, but this will be unnecessary most seasons in the commercial apple growing sections.

HOW TO TREAT INJURIES FROM MICE AND RABBITS

Remove carefully with a knife all loose and dead bark. Paint with asphaltum, coal tar, or white lead and oil, that part of the wound from which the bark and cambium layer have been removed, allowing none of the material used to come in contact with the live bark. If the tree has been completely girdled, the inner bark of cambium having been entirely destroyed, there are

only two ways to save the trees: to train up a new shoot from below the injury and above the bud, or to bridge graft. Where the entire trunk is girdled and the injury is more than twelve inches in length, it is doubtful if bridge grafting would be worth while, but where the injury is twelve inches or less it can be done successfully and is well worth while on trees that have been set from two to twenty years. The edges of the wound should be trimmed and the scions cut slightly longer than the injured area. Springing them slightly like a bow, insert the ends under the uninjured bark at the upper and lower edges of the wound. All exposed surfaces should be carefully waxed, and, if the injury is near the ground, the earth should be mounded well above it, so as to keep the injured portion moist and make conditions favorable for callousing or the uniting of the scions with the bark. From three to twelve or fifteen of these scions should be used. The number varying with the size of the tree. Good, thrifty, last season's growths are most easily handled and are most satisfactory. See Figure for illustration of bridge grafting.

STATISTICS

TABLE SHOWING NUMBER OF APPLE TREES AND PRODUCTION IN
BUSHEL IN NEW YORK STATE BY COUNTIES (U. S. CENSUS
1910)

County	Trees	Bushels
Albany	231,398	527,829
Allegany	199,084	238,385
Broome	115,582	142,037
Cattaraugus	287,788	558,039
Cayuga	252,458	484,341
Chautauqua	299,329	646,269
Chemung	62,779	84,726
Chenango	145,604	234,738
Clinton	147,313	73,691
Columbia	297,579	892,590
Cortland	95,277	131,575
Delaware	190,896	350,229
Dutchess	303,015	794,753
Erie	472,932	623,234
Essex	71,168	46,257
Franklin	73,303	75,795
Fulton	31,181	33,937
Genesee	300,865	581,026
Greene	274,123	630,061
Hamilton	4,793	6,451
Herkimer	83,601	136,281
Jefferson	79,896	82,413
Kings	50	40
Lewis	29,341	33,196
Livingston	144,958	218,441
Madison	140,569	225,464
Monroe	702,841	2,592,378
Montgomery	77,804	131,264
Nassau	10,140	15,403
New York	35	
Niagara	804,155	2,366,600
Oneida	184,979	264,627
Onondaga	202,140	282,411
Ontario	369,050	913,214
Orange	122,633	277,355
Orleans	549,749	2,229,462
Oswego	269,724	405,951
Otsego	194,986	282,384

County	Trees	Bushels
Putnam	48,483	121,815
Queens	122	162
Rensselaer	159,554	306,738
Richmond	742	1,211
Rockland	58,390	116,235
St. Lawrence	150,130	180,406
Saratoga	137,202	175,868
Schenectady	49,632	82,252
Schoharie	163,702	219,343
Schuyler	90,567	108,352
Seneca	123,437	276,604
Steuben	248,951	338,957
Suffolk	27,760	28,431
Sullivan	159,258	315,058
Tioga	76,203	90,324
Tompkins	119,084	154,058
Ulster	240,933	667,571
Warren	75,557	63,514
Washington	111,069	128,006
Wayne	812,410	3,304,197
Westchester	139,937	253,870
Wyoming	270,801	624,899
Yates	161,161	238,606
<hr/>		<hr/>
The State	11,248,203	25,409,324
<hr/>		<hr/>

INDEX

A

A grade apples, branding, 676.
 what constitutes, 671, 675, 676.
 America, Introduction of Apple into,
 and New York State, C. S.
 Wilson, 743-760.
 Anthony, R. D., Cover Crops, 785-
 793.
 Aphids, 846.
 Aphis, green, 659, 846.
 wooly, in nurseries, 651.
 Apple, crab, nomenclature of, 743,
 744.
 Diseases, Some of Our Most
 Common, H. H. Whetzel and
 L. R. Hesler, 855-870.
 fertilizers for, 811-815.
 graders in evaporating plants,
 948, 949.
 Grading Law, B. D. Van Buren,
 669-679.
 history of, 669, 670.
 inspection relative to, 690.
 interpretation of terms, 674-
 677.
 New York State, 670-674.
 standard grades under, 670,
 671, 674, 675.
 United States, 677, 678.
 violation of, 678.
 influence of early botanic gardens
 on, 746, 748.
 Insects Particularly Affecting
 the, E. P. Felt, 842-854.
 Introduction of, into America and
 New York State, C. S. Wil-
 son, 743-760.
 into colonies, 744, 746.
 into New York State, 748-
 755.
 first orchard planted, 748.
 orchards in Hudson Val-
 ley Section, 749, 750.
 Downing, orchard,
 750.

Apple, Introduction into New York
 State — Continued:
 orchards in Lake Region,
 750-755.
 work of Patrick
 Barry, 755.
 into the West, 755, 756.
 monuments to original varieties
 of, 759, 760.
 native, 743, 744.
 orchard, first planted in New
 York State, 748.
 old, care of, 824-829.
 young, care of, 816-823
 Orchards, Sod Mulch vs. Tillage
 for, W. D. Auchter, 803-810.
 Packing Train, F. S. Welsh, 679-
 683.
 equipment, 679.
 plan followed, 680, 681.
 representatives accompany-
 ing, 680.
 results obtained, 682, 683.
 propagation of, by Indians, 748,
 749.
 scab disease, 660, 855-861.
 control measures, 858-861.
 description of, 856, 858.
 influence of weather on, 858
 statistics relative to the, 965,
 966.
 tent caterpillar, 851, 852, 854.
 tillage methods for, 776-784.
 tree, borer, 854.
 canker, New York, 861-863.
 control measures, 862,
 863.
 European, 868.
 first in America, 744.
 well-known varieties, history of,
 756-760.
 worm, 846-850.
 Apples, central packing houses for,
 895-905.
 Dwarf, U. P. Hedrick, 871-888.
 evaporated, 937-949.

Apples — Continued:

- Exporting, C. W. Kimball, 911-914.
- Exports from United States and Canada, H. B. Knapp, 934-936.
- in New York City, Receipts and Prices for, H. B. Knapp, 927-934.
- of New York, S. A. Beach, 761-768.
 - in eastern New York, 765, 766.
 - in northern New York, 766-768.
 - in western New York, 762-765.
 - on Long Island, 766.
- Profits on a Barrel of, U. P. Hedrick, 889-894.
- selling at auction in Europe, 912, 913.
- Soil Types for Varieties of, H. J. Wilder, 769-775.
- Appleseed John, 755, 756.
- Arsenate of lead as spray, 829, 842, 848, 852.
- Atwood, G. G., Grafting and Budding, 957-966.
- Inspection Work of Department in Relation to Horticulture, 684-693.
- Auchter orchard, experiments in, 803-810, 889-894.
- Auchter, W. D., Sod Mulch vs. Tillage for Apple Orchards, 803-810.
- Auction Houses, a coming necessity, 925.
 - as Distributors of Fruit and Vegetables, V. K. McElheny, 915-926.
 - auctioneer, qualifications of, 920.
 - competitive bidding, 918.
 - expense of, 922.
 - history of business, 915, 916.
 - influence of, in bringing good prices, 922, 923.
 - in widening distribution, 924.
 - prices stand, 919, 920.
 - private sale method, 918.
 - public sale system, 918, 919.

Auction Houses — Continued:

- relief of glutted markets, 922.
 - service rendered by, 916.
 - Auctioneer, qualifications of, 920.
- B
- B grade apples, branding, 676.
 - what constitutes, 671, 675.
 - Baldwin apple, Auchter orchard experiments with, 803-810, 889-894.
 - history of, 756, 758.
 - monthly prices for a barrel of, 929-931.
 - monument to, 758, 759.
 - soils suited to, 773.
 - spot, 863-867.
 - cause of, 865.
 - Bark beetle, fruit tree, 854.
 - Barley as a cover crop in orchard, 791.
 - Barrel of apples, monthly prices for, 929-933.
 - Profit on a, U. P. Hedrick, 889-894.
 - Barry, Patrick, work of, in propagating apple, 755.
 - Beach, S. A., Apples of New York, 761-768.
 - Beans as cover crop in orchard, 791.
 - Ben Davis apple, monthly prices for, 931-933.
 - soils suited to, 775.
 - Bitter pit of apple, 863-867.
 - Black rot of apple tree, 861-863.
 - control measures, 862, 863.
 - Bleachers used in evaporating fruit, 949, 950.
 - Blight, fire, of apple, 870.
 - Blister canker, Illinois, 867, 869.
 - Blotch disease, sooty, 869, 870.
 - Bordeaux mixture as spray, 660, 842, 860.
 - Borers, 854.
 - Botanic gardens, influence of early, 746, 748.
 - Branding apple containers, 672, 673, 676.
 - Bridge grafting, 961, 964.

- Buckwheat as cover crop in orchard, 778, 791.
- Bud moth, 851, 852.
- Budding, flute, or ring, 963.
- Grafting and, G. G. Atwood, 957-966.
- in nurseries, 655, 657, 659.
- June, 963.
- methods used, 961-963.
- notes on, 965.
- proper time for, 961.
- Burritt, M. C., Intercropping the Young Orchard, 794-802.
- Buying Direct from Producers, Selling on Commission and, J. H. Killough, 906-910.
- C
- Canada, central packing houses in, 895-905.
- exports of apples from United States and, 934-936.
- Canker, apple tree, European, 867.
- New York, 861-863.
- control measures, 862-863.
- blister, Illinois, 867, 869.
- Cankerworms, 851, 852.
- Care of, Old Orchard, R. P. McPherson, 824-829.
- Young Trees, W. Hotaling, 816-823.
- Case bearers, 851, 852.
- Catchpole, E. W., Evaporated Fruit Industry in New York State, 937-949.
- Caterpillar, apple tent, 851, 852, 854.
- Central Lakes fruit-growing region, 643.
- Central Packing Houses, for New York Fruit, F. S. Welsh, 895-905.
- combination of, 903, 904.
- facilities for, in New York State, 904, 905.
- in Canada, 895-904.
- increase in number of, 903.
- in relation to Apple Packing Law, 895.
- methods of handling fruit in Canada, 900-902.
- Central Packing Houses — Continued:
- present methods of packing fruit in New York State, 896, 898.
- types of, 898-900.
- Champlain Valley, fruit growing in, 642.
- Chandler, W. H., Tillage, 776-784.
- Chautauqua Grape Belt, 644.
- Chicago Land Show, fruit exhibit at, 711, 712.
- Cion. See Scion.
- Cleft Grafting, 957, 959, 960.
- Closed package, branding of, 675, 676.
- meaning of, in Apple Law, 673, 677, 680, 681.
- repacking of, 677.
- Clover as cover crop in orchard, 778, 790.
- Codling moth, 846-850.
- control measures, 848-850.
- Color of apples, interpretation of law relative to, 674.
- Columbian Exposition, Exhibit of New New York Fruit at, E. van Alstyne, 706, 707.
- Commission merchant, true function of, 908, 909.
- Commission, Selling on, and Buying Direct from Producers, J. H. Killough, 906-910.
- Common Apple Diseases, Some of Our Most, H. H. Whetzel and L. R. Hesler, 855-870.
- Consumer, direct sales to, 906-908.
- Cover Crops, R. D. Anthony, 785-793.
- combinations, 793.
- in relation to tillage, 776-778, 781, 782, 803, 804.
- leguminous, 790, 791.
- non-leguminous, 791.
- principles of use, 785-790.
- Crab apple, the native apple, 743.
- Crown gall, danger of, in grafting, 655, 659, 660.
- Crown grafting, 959.
- Cultivation in the apple orchard, 776-784, 820, 826.
- Cutting back, inadvisability of severe, 837.

D

- Dawley, F. E., Fruit Exhibits at Pan-American Exposition, 707-709.
- Dehorning, inadvisability of severe, 837.
- Department of Agriculture, horticultural inspection work, 684-693.
- Diseases, Apple, Some of our Most Common, H. H. Whetzel and L. R. Hesler, 855-870.
- apple scab, 855-861.
 - Baldwin spot, 863-867.
 - bitter pit, 863-867.
 - black rot, 861-863.
 - canker, apple tree, European, 867.
 - New York, 861-863.
 - blister, Illinois, 867-869.
 - fire blight, 870.
 - leaf spot, 861-863.
 - sooty blotch, 869, 870.
 - stippin, 863-867.
- Districts, Fruit, of New York, U. P. Hedrick, 638-645.
- Doucin as dwarf stock, 874-888.
- Downings, influence of, on apple industry, 750.
- Drainage, importance of, in fruit growing, 651, 652, 653, 769, 770, 771, 775.
- Dwarf apples, U. P. Hedrick, 871-888.
- experiments relative to, 874-888.
 - care of orchards, 876.
 - plan of, 876.
 - results of, 878-887.
 - size, color, quality of apples, 887.
 - size of trees, 882.
 - suckering habit, 882.
 - surface rooting, 880, 882.
 - time of bearing, 886.
 - union of stocks and scions, 878, 880.
 - varieties that do best, 887.
 - winter injury, 880.
 - yield of fruit, 884-886.
 - how formed, 871.
 - stocks, dwarfing, 872, 874.
 - standard, 872.
- Dwarfing stocks, 872, 874.

E

- Early Joe apple, monument to, 745, 760.
- Eastern New York Horticultural Society, 729.
- Eastern Plateau, fruit growing in, 642, 643, 765, 766.
- Equilateral method of setting trees, 818, 819.
- Erie shore fruit district, 644, 645.
- Essentials of tree growth, 824, 826.
- Europe, selling apples at auction in; 912, 913, 915, 916.
- European apple-tree canker, 868.
- Evaporated Fruit Industry of New York State, E. W. Catchpole, 937-953.
- appliances used in, 940-951.
 - evolution of, 937, 939.
 - markets, 951-953.
- Evaporation, apples suitable for, 939.
- appliances for, 940, 942.
 - early history of, 940, 942.
 - later types, 946.
 - middle period types, 942.
 - process of, 940.
- Evaporators, 940-951.
- machinery and appliances, 948-951.
 - apple graders, 948, 949.
 - bleachers, 949, 950.
 - fuel, 951.
 - furnace, 950, 951.
 - paring machine, 949.
 - racks, 951.
- Exhibits, fruit, at Columbian Exposition, 706, 707.
- at Land Shows, 710-712.
 - at Panama Exposition, 712-716.
 - at Pan-American Exposition, 707-709.
 - at State Fair, 694-705.
- Exporting Apples, C. W. Kimball, 911-914.
- competition with Canada, 913.
 - growth of business, 911.
 - importance of good pack, 911, 912.
 - sales by auction, 912, 913.
 - South American trade, 913, 914.
 - varieties for special markets, 912.

Exports of Apples from United States and Canada, H. B. Knapp, 934-936.

F

Fancy grade apples, branding, 676.
 what constitutes, 670, 671, 674.
 Felt, E. P., Insects Particularly Affecting the Apple, 842-854.
 Fertilizers, experiments with, 811, 812, 814.
 factors governing use of, 814, 815.
 for Fruits, U. P. Hedrick, 811-815.
 soils requiring, 814.
 why apples do not need, 812-815.
 Fire blight, in nurseries, 660.
 of apples, 870.
 Flute budding, 963.
 Fraser, S., Nursery Industry in New York, 646-661.
 French Paradise as dwarf stock, 874-888.
 Fruit, Central Packing Houses for New York, F. S. Welsh, 895-905.
 Districts of New York, U. P. Hedrick, 638-645.
 Central Lakes, 643, 644.
 Eastern Plateau, 642, 643.
 Erie Shore, 644, 645.
 Hudson Valley, 640.
 Long Island, 639.
 Mohawk Valley, 642.
 Ontario Shore, 644.
 St. Lawrence and Champlain Valleys, 640, 642.
 Western Plateau, 645.
 evaporated, 937-953.
 Exchange, Hudson River, W. Y. Velie, 731-740.
 exhibits, 694-716.
 at Columbian Exposition, E. van Alstyne, 706, 707.
 at Land Shows and Panama Exposition, C. G. Porter, 710-716.
 at Pan-American Exposition, F. E. Dawley, 707-709.

Fruit—Continued:

exhibits, at State Fair, History of, H. B. Knapp, 694-705.
 by boys and girls, 705.
 collective, 702.
 early premium list, 696-699.
 educational, by experiment station, 702, 703.
 itinerant period of, 694.
 permanent location secured for, 699-702.
 single plate, 703.
 value of, to state, 705.
 Growers' Association, New York State, E. C. Gillett, 727-730.
 early history, 727.
 Eastern New York Society, 729.
 field meetings, 730.
 objects of, 728.
 work of, 728, 729.
 Fruit-tree bark beetle, 854.
 Fruits, Auction Houses as Distributors of, V. K. McElheny, 915-926.
 Fertilizers for, U. P. Hedrick, 811-815.
 value of, in New York State, 635.
 Fungicides, law relative to, 690.

G

Gillett, E. C., New York State Fruit Growers' Association, 727-730.
 Grading Law, Apple, B. D. Van Buren, 669-679.
 in Canada, 895-905.
 Grafting, and Budding, G. G. Atwood, 957-966.
 dangers of crown gall in, 655, 659, 660.
 in nurseries, 655, 658, 659.
 introduction of, 750.
 methods of, 957-961, 963.
 bridge, 961.
 cleft, 957, 959, 960.
 crown, 959, 963.
 insert, 963.

Grafting, Methods of — Continued:

- peg, 963.
- root, 959.
- saddle, 963.
- splice, 957-959.
- tongue, 957-959.
- top, 957-959.
- wedge, 957, 959, 960.

notes on, 965.

of grapevines, 965, 966.

wax, 961.

Grape Belt, Chautauqua, 644.

Grapevines, grafting, 965, 966.

Green, aphid, 659, 846.

fruit worm, 851, 852.

Grimes apple, soils suited to, 774, 775.

H

Hairy root of apple, 651, 659, 660.

Hall, John, Western New York Horticultural Society, 717-726.

Hardpan in relation to orchard land, 770.

Hedrick, U. P., Dwarf Apples, 871-888.

Fertilizers for Fruits, 811-815.

Fruit Districts of New York, 638-645.

Profits on a Barrel of Apples, 889-894.

Hesler, L. R., Some of our Most Common Apple Diseases (with H. H. Whetzel), 855-870.

History of Fruit Exhibits at State Fair, H. B. Knapp, 694-705.

Hitchings method in care of orchard, 803.

Hop kiln evaporator, 946.

Horticultural, exhibits at fairs and expositions, 694-716.

inspection work by Department of Agriculture, 684-693.

publications, Department, 693.

Society, Eastern New York, 729.

Western New York, John Hall, 717-726.

Hotaling, W., Care of Young Trees, 816-823.

Hubbardston apples, soil suitable for, 774.

Hudson River Fruit Exchange, W. Y.

Velie, 731-740.

buying and selling direct, 736.

by-laws of, 733, 734.

constitution, 732, 733.

membership and finances, 737, 739.

methods of disposing of products, 735, 736.

organization, 731, 732.

selling through commission houses, 735, 736.

work accomplished, 739, 740.

Hudson Valley fruit district, 640.

early orchards in, 749, 750.

I

Illinois blister canker, 867, 869.

Inarching, 963.

Injuries, Physical, to Trees, B. D. Van Buren, 963, 964.

Insecticides, law relative to, 690.

use of, 842, 846.

Insects Particularly Affecting the Apple, E. P. Felt, 842-854.

aphids, or plant lice, 846.

apple worm, 846-850.

borers, 854.

apple-tree, 854.

fruit-tree bark beetle, 854.

codling moth, 846-850.

leaf feeders, early, 851-854.

apple tent caterpillar, 851, 852.

bud moth, 851, 852.

cankerworms, 851, 852.

case bearers, 851, 852.

green fruit worms, 851, 852.

leaf roller, 851, 852, 854.

red bugs, 850, 851.

scale, oyster shell, 844, 845.

San José, 829, 843, 844.

scurvy, 845.

Insert grafting, 963.

Inspection Work of Department in Relation to Horticulture, G. G. Atwood, 684-693.

apple grading, 690.

bee, 690, 691.

insecticides and fungicides, 690.

Inspection works — Continued:

- nursery, 685.
- orchard, 688.
- pathological, 689.
- scouting, 687.
- shipment, 685-687.
- foreign, 687.

Intercrop in orchard, 781, 794-802.

Intercropping the Young Orchard, M.

C. Burritt, 794-802.

apples with peaches, 800-802.

cost of production, 795-797.

returns and expenses, 798-800.

value of, 797, 798.

Introduction, 635-637.

of Apple into America and New York State, C. S. Wilson, 743-760.

J

Jonathan apple, soils suited to, 774, 775.

June budding, 963.

K

Killough, J. H., Selling on Commission and Buying Direct from Producers, 906-910.

Kiln evaporators, 946-951.

Kimball, C. W., Exporting Apples, 911-914.

Knapp, H. B., History of Fruit Exhibits at State Fair, 694-705.

Receipts and Prices of Apples and Exports from United States and Canada, 927-936.

L

Law, Apple Grading, B. D. Van Buren, 669-679.

Leaf roller, 851, 852, 854.

Leaf spot of apple, 861-863.

Leguminous cover crops, 790, 791.

Lice, plant, treatment for, 846.

Lime-sulphur as spray, 660, 828, 829, 842, 844, 860.

Lined red bug, 850, 851.

Long Island, fruit growing on, 639, 766.

Low-headed trees, pruning to produce, 832.

M

McElheny, V. K., Auction Houses as Distributors of Fruits and Vegetables, 915-926.

McIntosh apple, monument to, 745, 759.

soils adapted to, 774.

McKay, G. H., Various Methods of Refrigeration and Advantage to Public, 662-668.

McPherson, R. P., Care of the Old Orchard, 824-829.

Marketing fruit, problems of, 927, 928.

method used by Hudson River Fruit Exchange, 735, 736.

Melon apple, monument to, 745, 760.

Mice, injury to trees by, 963, 964.

Minimum size, apple law, 671, 672, 676.

Miscible oil in spray, 854.

Mohawk Valley, fruit growing in, 642.

Monuments to varieties of apples, 759, 760.

N

New York, apple-tree canker, 861-863.

Apples of, S. A. Beach, 761-768.

City, apples in, receipts and prices of, 927-934.

Fruit Districts of, U. P. Hedrick, 638-645.

Land Shows, fruit exhibits at, 710, 711.

Nursery Industry in, S. Fraser, 646-661.

State, Evaporated Fruit Industry of, E. W. Catchpole, 937-953.

Fruit Growers' Association, E. C. Gillett, 727-730.

Introduction of Apple into America and, C. S. Wilson, 743-760.

Nicotine in spray, 842, 844, 846, 851.

Northern, New York, apple growing in, 766-768.

- Northern Spy apple, history of, 758.
 monthly prices for, 931.
 monument to, 747, 760.
 soil types for, 774.
- Nova Scotia, central packing houses in, 898-903.
- Nursery Industry in New York, S. Fraser, 646-661.
 after-management, 657, 659.
 digging, method of, 659.
 drainage, importance of, 651, 652, 653.
 history of, 660.
 insects and diseases, 659, 660.
 planting, 653, 654.
 preparation of land, 652, 653.
 seedlings, 656.
 selection and purchase of stock, 654, 661.
 soils adapted to, 650, 651.
 disease in certain, 651, 652.
 statistics relative to, 648-650.

O

- Oats as cover crop in orchard, 778, 791.
- Old Orchard, Care of, R. P. McPherson, 824-829.
- Oldenburg apple, soils desirable for, 775.
- Ontario Shore fruit district, 644.
- Orchard, apple, Auchter, experiments in, 803-810, 880-894.
 first planted in New York State, 748.
 laying out, 816-819.
 Old, Care of, R. P. McPherson, 824-829.
 cultivation, 826.
 essentials to tree growth, 824, 826.
 fertilization, 826.
 pruning, 827, 828.
 spraying, 828, 829.
 young, care of, 820-823.
 Intercropping the, M. C. Burritt, 794-802.
- Orchards, apple, Sod Mulch vs. Tillage for, W. D. Auchter, 803-810.
- Oyster-shell scale, 844, 845.

P

- Packing, apple, law relative to, 669-679.
 Train, F. S. Welsh, 679-683.
 Houses, Central, for New York Fruit, F. S. Welsh, 895-905.
 types of, 898-900.
 present methods of, 896, 898.
- Panama Exposition, fruit exhibits at, 712-716.
- Pan-American Exposition, Fruit Exhibits at, F. E. Dawley, 707-709.
- Paring machine in evaporating plant, 949.
- Peas as cover crop in orchard, 778, 791.
- Peg grafting, 963.
- Physical Injuries to Trees, B. D. Van Buren, 963, 964.
- Plant lice, treatment for, 846.
- Porter, C. G., New York Fruit at Land Shows and San Francisco Exposition, 710-716.
- Powdery mildew, 660.
- Prices of apples, receipts and, 927-934.
- Primate apple tree, tablet in memory of, 751, 760.
- Producers, Buying Direct from, Selling on Commission and, J. H. Kilbough, 906-910.
- Profits on a Barrel of Apples, U. P. Hedrick, 889-894.
 average yield, 889-890.
 balance sheet, 894.
 cost of, barrels, 893.
 harvesting, 892, 893.
 pruning, 892.
 spraying, 892.
 tillage, 891, 892.
 depreciation of outfit, 891.
 expense of superintendent, 892.
 interest on investment, 890, 891.
 orchard selected, 889.
 prices received, 894.
 summary, 893.
 taxes, 891.
- Pruning, E. van Alstyne, 830-841.
 advisability of annual, 834.

Pruning — Continued:

- cutting back or dehorning, 837.
- dangers of too severe, 831.
- dwarf trees, 878.
- in old orchard, 827, 828.
- low-headed trees, 832.
- proper time for, 838, 839.
- reasons for, 830, 831.
- root, 840, 841.
- thinning, 834-837.
- tools, 841.
- tree surgery, 839, 840.
- young trees, 819, 831, 832.

Public sales of fruit, 915-926.

R

- Rabbits, injuries to trees by, 963, 964.
- Rape as cover crop in orchard, 778, 791.
- Reading Terminal Market, refrigeration at, 666, 667.
- Receipts and Prices of Apples in New York City, H. B. Knapp, 927-936.
 - monthly prices of, Baldwin, 929.
 - Ben Davis, 931-933.
 - Northern Spy, 931.
 - Rhode Island Greening, 931.
- Red bugs, 850, 851.
- Refrigeration, Various Methods of, and Advantage to Public, G. H. McKay, 662-668.
 - growth of practice, 665.
 - methods of, 662, 664.
 - need of additional plants, 667.
 - organization, value of, 668.
 - result of, at Reading Terminal Market, 665, 667.
 - small plants for farmers, 664, 665.
- Rhode Island Greening, history of, 758, 759.
 - monthly prices for, 931.
 - soil types for, 771-773.
- Ring budding, 963.
- Root, grafting, 959.
 - pruning, 840, 841.
- Rosy apple aphid, 846.
- Rye as cover crop in orchard, 791.

S

- Saddle grafting, 963.
- St. Lawrence Valley, fruit growing in, 640, 642.
- Scale insects, 829, 843-845.
 - oyster-shell, 844, 845.
 - San José, 829, 843, 844.
 - scurvy, 845.
- San José scale, 829, 843, 844.
 - control methods, 829, 844.
- Scab disease, apple, 855-861.
- Schoharie Valley, fruit growing in, 642.
- Scion, for grafting, care of in winter, 957.
 - roots in dwarf apple experiment, 876, 878.
 - union of stocks and, 878, 880.
- Scurvy scale, 845.
- Seedlings in nursery growing, 654, 655, 656.
- Selling on Commission and Buying Direct from Producers, J. H. Killough, 906-910.
 - buying from orchard, 909, 910.
 - direct sales to consumer impractical, 906-908.
 - true function of commission merchant, 908, 909.
- Setting trees, systems of, 818, 819.
- Shot-hole, fungus on cherry, 660.
 - made by borers, 854.
- Side worm injury, 848, 850.
- Sod mulch, system in orchard, 804.
 - vs. Tillage for Apple Orchards, W. D. Auchter, 803-810.
 - costs and returns, 809.
 - cultural experiments, 805-808.
 - results obtained, 807.
 - effects of two methods, 805, 808, 809.
- Some of Our Most Common Apple Diseases, H. H. Whetzel and L. R. Hesler, 855-870.
- Sooty blotch disease of apple, 869, 870.
- Soil, general requirements as to, 769-771.

- Soil Types, for Varieties of Apples,
H. J. Wilder, 769-775.
Baldwin, 773.
Ben Davis, 775.
Hubbardston, 774.
McIntosh, 774.
Northern Spy, 774.
Oldenburg, 775.
R. I. Greening, 771-773.
Sutton, 774.
Twenty-ounce, 775.
Wagener, 775.
Wealthy, 775.
- South America, shipping apples to,
913, 914.
- Splice grafting, 957-959.
- Spraying, for apple scab, 860, 861.
for codling moth, 848, 850.
for leaf-eating insects, 852, 854.
for plant lice, 846.
for red bugs, 851.
for San José scale, 844.
old orchards, 828, 829.
young orchards, 821-823.
- Square system of setting trees, 818.
- Standard grades for apples, 670, 671,
674, 675.
- State Fair, Fruit Exhibits at, History
of, H. B. Knapp, 694-705.
- Statistics, apple, 965, 966.
nursery, 648-650.
- Stippin disease of apple, 863-867.
- Stocks, dwarfing, experiments relative
to, 874-888.
- Stone, inadvisability of using in
orchards, 770.
- Storage, branding of apples in, 673,
677.
- Suckering habit of dwarf stock, 882,
888.
- Surface rooting of dwarf stock, 880,
882.
- Sutton apple, soils adapted to, 774.
- Tillage, W. H. Chandler, 776-784.
cost of, in Auchter experiment,
891, 892.
cultivation of young trees, 781.
in renovating old orchards, 784.
kinds of cover crops, 777, 778.
of bearing orchards, 782, 783.
of young orchard, 781, 782.
proper time for, 776.
relation of, to winter injury,
778-781.
system in orchard, 804, 805.
Sod Mulch vs., for Apple
Orchards, W. D. Auchter, 803-
810.
- Tolerance allowance in grading
apples, 672, 677.
- Tompkins King apple, history of, 758.
soils adapted to, 774, 775.
- Tongue grafting, 957-959.
- Tools for pruning, 841.
- Top grafting, 957-959.
- Topping evaporator, 940.
- Tower-evaporator, 942-946.
- Train, Apple Packing, F. S. Welsh,
679-683.
- Tree, apple, first in America, 744.
surgery, 839, 840.
- Trees, Physical Injuries to, B. D.
Ven Buren, 963, 964.
setting, systems of, 818, 819.
- Young, Care of, W. Hotaling,
816-823.
cultivation, 820.
fall versus spring planting,
820.
laying out orchard, 816-819.
distance between trees,
817.
pruning at time of setting,
819.
spraying, 821-823.
systems of setting, 818, 819.
- True red bug, 850, 851.
- Turnips as cover crop in orchard, 778,
791.
- Twenty-ounce apple, soils suited to,
775.
susceptibility of, to apple-tree
canker, 863.
- Two-kiln type evaporators, 946-951.

T

- Tent caterpillar, apple, 851, 852, 854.
- Thinning, method of, 834-837.
- Thirty-six point Gothic type, sample
of, 676.

U

- Ungraded apples, branding of, 671, 675, 676.
 United States, apple grading law, 677, 678.
 exports of apples from Canada and, 934-936.

V

- Van Alstyne, E., Exhibit of New York Fruit at Columbian Exposition, 706, 707.
 Pruning, 830-841.
 Van Buren, B. D., Apple Grading Law, 669-679.
 Physical Injuries to Trees, 963, 964.
 Various Methods of Refrigeration and Its Advantage to Public, G. H. McKay, 662-668.
 Velie, W. Y., Hudson River Fruit Exchange, 731-740.
 Vetch as cover crop in orchard, 778, 790, 791.

W

- Wagener apple, soils desirable for, 775.
 Water sprouts on trees, 827, 831, 838.
 Wealthy apple, monument to, 759, 760.
 soils adapted to, 775.
 Wax, grafting, 961.
 Wedge grafting, 957, 959, 960.

- Welsh, F. S., Apple Packing Train, 679-683.
 Central Packing Houses for New York Fruit, 895-905.
 Western New York apple belt, 643, 644.
 Western New York Horticultural Society, J. Hall, 717-726.
 early history of, 717-723.
 membership fees, 726.
 object of, 726.
 present officers of, 726.
 presidents, 723.
 Western Plateau, fruit growing on, 645, 762-765.
 Wheat as cover crop in orchard, 791.
 Whetzel, H. H., Some of Our Most Common Apple Diseases (with L. R. Hesler), 855-870.
 Wilder, H. J., Soil Types for Varieties of Apples, 769-775.
 Wilson, C. S., Introduction of Apple Into America and New York State, 743-760.
 Winter injury, in dwarf apple experiment, 880.
 relation of, to tillage, 778-781.
 Wooly aphid in nurseries, 651.
 Worm, apple, 846-850.

Y

- Young Trees, Care of, W. Hotaling, 816, 823.

Z

- Zimmerman evaporator, 942.

Department of Agriculture Bulletin

Published monthly by the Department of Agriculture of the State of New York

Entered as second-class matter March 2, 1911, at the post office at Albany, N. Y.,

under the Act of June 6, 1909.

ALBANY, N. Y.

JANUARY, 1916

Bulletin 79

(Part II)

The Fruit Industry in New York State

Part I treats of the fruit industry of the state in all its phases, followed by detailed information relative to the apple

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE

CHARLES S. WILSON, Commissioner

Bulletin 79
(Part II)

The Fruit Industry in New York State

Issued by the Bureau of Farmers' Institutes and Compiled under the
Supervision of the Director

CONTENTS

	PAGE
The Pear	989
Varieties of Pears for Eastern New York, J. R. Cornell.....	991
Varieties of Pears for Western New York, Ira Pease.....	1000
Cultural Methods for Pears, Ira Pease.....	1007
Pruning Pear Trees, Arthur Farrand.....	1015
Some Insects Attacking the Pear, and Their Control, P. J. Parrott..	1019
Diseases of Pears, M. F. Barrus.....	1039
Packing and Marketing Pears, Arthur Farrand.....	1052
Statistics	1056
The Peach	1059
Peaches in Eastern New York, P. L. Husted.....	1061
Peaches in Western New York, E. H. Anderson.....	1069
Cultural Methods for the Peach, and Marketing, A. T. Henry.....	1077
Pruning the Peach, M. A. Blake.....	1084
Insects and Diseases of the Peach, L. F. Strickland.....	1094
Packing and Marketing the Peach, A. G. Gulley.....	1116
Statistics	1118
The Cherry	1121
Varieties of Cherries, U. P. Hedrick.....	1123
Cultural Methods in Growing the Cherry, W. L. McKay.....	1135
Cherry Insects, C. R. Crosby.....	1143
Diseases of the Cherry, L. R. Hesler.....	1150
Marketing Cherries, C. K. Scoon.....	1152
Statistics :	1156
The Plum and Prune.....	1159
Varieties of Plums, U. P. Hedrick.....	1161
Cultural Methods and Pruning for Plums and Prunes, G. H. Howe	1172
The Common Insect Enemies of the Plum, F. H. Lathrop.....	1183
Diseases of the Plum, L. R. Hesler.....	1190
Marketing Plums and Prunes, G. H. Howe.....	1200
Statistics	1204
The Quince	1207
Quinces, H. L. Brown.....	1209
Statistics	1214
The Grape	1217
A Look Backward on the Grape, L. H. Bailey.....	1219
Varieties of Grapes, U. P. Hedrick	1228
Grape-growing Sections of New York, F. E. Gladwin.....	1238
The New York Wine Industry, L. J. Vance.....	1246
The Grape Juice Industry, Gerald Frey.....	1268
Cultural Methods for the Grape in New York, F. E. Gladwin.....	1272

The Grape (Continued):	PAGE
Control of Insects Injurious to the Grape, F. Z. Hartzell.....	1296
Diseases of Grapes, Donald Reddick.....	1314
Production and Marketing of Grapes in the Chautauqua Belt, S. J. Lowell	1322
Hybrid Grapes at Geneva, R. D. Anthony.....	1331
Statistics	1339
The Strawberry	1341
Strawberries, William Palmer	1343
Statistics	1348
The Raspberry	1351
Raspberries, O. M. Taylor	1353
Red Raspberries	1353
Black Raspberries	1360
Purple Raspberries	1366
Statistics	1367
The Blackberry and Dewberry	1369
Blackberries and Dewberries, O. M. Taylor	1371
The Currant	1379
Currants, O. M. Taylor	1381
The Gooseberry	1389
Goseberries, O. M. Taylor	1391
Statistics of Small Fruits	1397
Fruits in the Home	1399
The Dietetic Value of Fruit, I. S. Harrington	1401
Index	1419

ILLUSTRATIONS

	PAGE
Fig. 286. Kieffer Pears, Showing Desirable Size.....	991
Fig. 287. Bartlett Pears	992
Fig. 288. Yount Kieffer Orchard on Farm of L. L. Morrell.....	994
Fig. 289. Beurre Bosc Pear	995
Fig. 290. Anjou Pear	998
Fig. 291. Clapp's Favorite Pear.....	1000
Fig. 292. Branch of Seckel Pears	1002
Fig. 293. Packing Barletts	1003
Fig. 294. Kieffer Trees on Farm of L. L. Morrell.....	1004
Fig. 295. Winter Nelis Pear	1006
Fig. 296. Sutton Beauty Orchard on Farm of L. L. Morrell.....	1008
Fig. 297. Drawing to Table — Orchard of Ira Pease.....	1010
Fig. 298. Boxed Bartletts from Orchard of Ira Pease.....	1012
Fig. 299. Bartlett Pear Orchard Pruned to Carry a Large Burden of Fruit — Farm of Arthur Farrand.....	1014
Fig. 300. Wheel Ladder for Pruning Trees or Picking Fruit.....	1016
Fig. 301. The Sinuate Borer	1020
Fig. 302. The Round-headed Apple Tree Borer.....	1021
Fig. 303. Common Scale Insects	1023
Fig. 304. The Codling Moth and Its Work on Apple.....	1025
Fig. 305. The False Tarnished Plant Bug	1026
Fig. 306. Pears Injured by the False Tarnished Plant Bug	1027
Fig. 307. The Pear Midge and Young Pears Deformed by Larvae.....	1028
Fig. 308. The Pear Thrips; Adult	1028
Fig. 309. The Pear Thrips; Eggs	1029
Fig. 310. The Pear Thrips; Larvae	1029
Fig. 311. Blighting of Blossom Clusters Due to Work of Thrips.....	1030
Fig. 312. The Plum Curculio and Its Work on Young Pears.....	1031
Fig. 313. The Green Fruit Worm and Its Work.....	1034
Fig. 314. The Pear Psylla; Adult.....	1035
Fig. 315. The Pear Psylla; Eggs	1035
Fig. 316. The Pear Psylla; Larva	1036
Fig. 317. The Pear Slug; Larva and Work on Leaf.....	1037
Fig. 318. The Blister Mite; Adult	1037
Fig. 319. The Blister Mite; and Its Work on Leaves	1038
Fig. 320. Fire Blight Cankers on Limb of Tree	1040
Fig. 321. Twig Blight	1041
Fig. 322. Blossom Blight	1041
Fig. 323. Cankered Limb Showing Exuding Milky Drops	1042
Fig. 324. Scab on Fruit of Pear	1048

	PAGE
Fig. 325. Leaf Spot on Pear	1050
Fig. 326. Leaf Blight on Quince	1051
Fig. 327. Leaf Blight on Fruit of Pear.....	1051
Fig. 328. Well-grown Pears Ready to be Picked for Market.....	1053
Fig. 329. Young Peaches Thriving on Soil of Slate Rock.....	1061
Fig. 330. Elbertas, Ungraded	1063
Fig. 331. Sixty-Basket Loads from Orchard to Packing House	1064
Fig. 332. Small Trucks Which Can Deliver Only Local Loads with Economy	1066
Fig. 333. Truck Ready to Leave Orchard of H. H. Brown.....	1067
Fig. 334. Looking North from the Ridge Road in Niagara County..... (Peach Rows Nearly One Mile Long.)	1069
Fig. 335. Trees Planted 18 Feet Apart Nearly Touch at Five Years....	1070
Fig. 336. One Tree from Orchard Shown in Fig. 335.....	1072
Fig. 337. View in a 25-year-old Peach Orchard in Niagara County....	1073
Fig. 338. An 8-year-old Peach Tree That Has Not Been Headed Back..	1074
Fig. 339. An 8-year-old Peach Tree, Pruned to Keep the Bearing Wood Low	1075
Fig. 340. Nursery Trees, Showing Contrast of Vigor.....	1085
Fig. 341. Well-formed, Compact One-year-old Tree in the Orchard.....	1087
Fig. 342. Reeves Tree Not Cut Back During Its Growth.....	1088
Fig. 343. One-year-old Tree Before Pruning.....	1089
Fig. 344. One-year-old Tree After Pruning.....	1090
Fig. 345. By Some Cutting Back of Branches, More Compact Trees Are Formed	1091
Fig. 346. The Curculio and Its Work	1095
Fig. 347. Work of a Plant Bug	1096
Fig. 348. Work of the Shot-Hole Borer	1100
Fig. 349. Channels Made by the Shot-Hole Borer.....	1101
Fig. 350. The Lesser Peach Borer and the Peach-Tree Borer.....	1103
Fig. 351. Mounding of Peach Trees to Check Borers and Prevent Freez- ing	1105
Fig. 352. Crown Gall	1106
Fig. 353. Shot-Hole Effect on Peach Foilage	1108
Fig. 354. Brown Rot of the Peach	1109
Fig. 355. Sclerotia Stage of Brown Rot on the Ground.....	1110
Fig. 356. Frozen Crotch	1114
Fig. 357. Fungused Stub Canker	1115
Fig. 358. Early Richmond Cherry	1124
Fig. 359. Montmorency Cherry	1126
Fig. 360. English Morello Cherry	1128
Fig. 361. Schmidt Cherry	1130
Fig. 362. Windsor Cherry	1132
Fig. 363. Cherry Pickers on Farm of W. L. McKay.....	1136
Fig. 364. A Thirsty Day in the Orchard.....	1137
Fig. 365. Montmorency Cherry Orchard in Bloom.....	1138
Fig. 366. Three-Year Montmorency Orchard on Farm of W. L. McKay..	1140
Fig. 367. Napoleon Orchard in Bloom; Spraying Apparatus in Fore- ground	1141

	PAGE
Fig. 368. Plum Curculio Adult	1143
Fig. 369. Egg-laying Punctures of the Plum Curculio in Cherries.....	1144
Fig. 370. Cherry Fruit-Fly	1145
Fig. 371. Infested Cherries at About the Time the Larvae Leave Them.....	1145
Fig. 372. Cherry Leaves Curled by Aphis.....	1146
Fig. 373. Leaves Riddled by Red Cherry Leaf-Beetle.....	1148
Fig. 374. Red Cherry Leaf-Beetle	1149
Fig. 375. Powdery Mildew on Sour Cherry Twigs and Leaves.....	1150
Fig. 376. Picking Montmorency Cherries in Orchard of W. L. McKay..	1153
Fig. 377. Picking and Packing Cherries in Orchard of W. L. McKay..	1154
Fig. 378. Loading Cherries for Canning Factory.....	1155
Fig. 379. The Bradshaw Plum	1162
Fig. 380. The Burbank Plum	1164
Fig. 381. The German Prune	1166
Fig. 382. The Lombard Plum	1168
Fig. 383. Pond, French Damson, Yellow Egg, and Italian Prune.....	1170
Fig. 384. Burbank Unpruned	1174
Fig. 385. Burbank Pruned	1175
Fig. 386. An Orchard of Burbank Trees Showing the Low Vase-formed Heads	1177
Fig. 387. Bavay Unpruned	1179
Fig. 388. Bavay Pruned	1181
Fig. 389. Young Plum Showing Injury by Curculio.....	1184
Fig. 390. San José Scale	1185
Fig. 391. Work of the Fruit-Tree Bark Beetle on Plum Limb.....	1188
Fig. 392. Adult Lesser Peach-Tree Borer.....	1189
Fig. 393. Black Knot on Plum	1191
Fig. 394. Brown Rot on Plum Fruits	1193
Fig. 395. Brown Rot Cankers on Plum Twigs.....	1194
Fig. 396. Leaf Spot of Plum	1196
Fig. 397. Plum Pockets or Plum Bladder on the Fruit.....	1197
Fig. 398. Examining the Quinces	1210
Fig. 399. A Quince Tree in Orchard of H. L. Brown.....	1211
Fig. 400. Sizing up the Crop	1212
Fig. 401. The Catawba Grape	1223
Fig. 402. The Concord Grape	1225
Fig. 403. The Brighton Grape	1229
Fig. 404. The Niagara Grape	1234
Fig. 405. The Worden Grape	1236
Fig. 406. Map Showing Location of Grape Districts in New York.....	1240
Fig. 407. Grape Harvest in the Lake Keuka District.....	1246
Fig. 408. Champagne Maturing in Vault	1248
Fig. 409. Plant of Pleasant Valley Wine Company.....	1250
Fig. 410. Urbana Wine Company's Cellars.....	1252
Fig. 411. Champagne Vault of the Urbana Wine Co., Showing Clearing Table	1254
Fig. 412. Improved Hydraulic Wine Press	1256
Fig. 413. Section of Press Room, Showing Hydraulic Presses.....	1258
Fig. 414. Single Grape Rack for Hydraulic Wine Press.....	1259

	PAGE
Fig. 415. Double Rack for Hydraulic Wine Press	1259
Fig. 416. Washing Wine Bottles by Machinery.....	1261
Fig. 417. Bottling and Corking the New Champagne.....	1262
Fig. 418. Finishing and Final Corking of Champagne.....	1264
Fig. 419. Preparing Champagne for Shipment	1265
Fig. 420. A Hillside Vineyard	1273
Fig. 421. Mammoth Clover as a Green Manure in the Vineyard.....	1274
Fig. 422. A Barley Green Manure	1278
Fig. 423. Harvesting the Crop	1281
Fig. 424. The Single-Stem Kniffen System of Training.....	1283
Fig. 425. The Two-Stem Kniffen System.....	1284
Fig. 426. The Umbrella System	1285
Fig. 427. The High Renewal Type	1286
Fig. 428. Delawares Trained to High Renewal	1287
Fig. 429. Catawbas Trained to High Renewal.....	1287
Fig. 430. The Chautauqua System	1289
Fig. 431. Early Summer Tillage	1290
Fig. 432. Horse-hoeing Away from the Vines	1291
Fig. 433. The Diamond-Tooth Cultivator, a Good Weed Eradicator....	1292
Fig. 434. Mammoth Clover and Chickweed Covering the Vineyard....	1294
Fig. 435. Loading the Grapes for Transfer to Packing Shed.....	1295
Fig. 436. Injury to Roots of Grape by Larvae of Grape Root-Worm...	1297
Fig. 437. Larva of Grape Root-Worm	1298
Fig. 438. Adult of Grape Root-Worm	1298
Fig. 439. Feeding by Adults of the Grape Root-Worm.....	1299
Fig. 440. Result of Feeding by Adults of Grapevine Flea-Beetle.....	1300
Fig. 441. Eggs of Grapevine Flea-Beetle on Grape Cane.....	1301
Fig. 442. Larvae of Grapevine Flea-Beetle Feeding on Grape Leaf.....	1302
Fig. 443. Adult of Grapevine Flea-Beetle	1303
Fig. 444. Adult Rose Chafer	1304
Fig. 445. Larva of Rose Chafer	1305
Fig. 446. Nymph of Grape Leaf-Hopper	1306
Fig. 447. Adult Grape Leaf-Hopper	1306
Fig. 448. Conditions Favorable for the Hibernating of Grape Leaf- Hopper ..	1307
Fig. 449. Injury to Fruit by Larvae of Grape-Berry Moth.....	1309
Fig. 450. Injury to Fruit by Larvae of Grape-Berry Moth, Showing Cluster After Infested Fruit Has Been Removed.....	1310
Fig. 451. Larvae of First Brood of Grape-Berry Moth, Feeding on Exterior of Fruit	1311
Fig. 452. Larvae of the Grape-Berry Moth, Forming Cocoons.....	1312
Fig. 453. Pupae of the Grape-Berry Moth	1313
Fig. 454. Black Rot on Fruit of Niagara	1315
Fig. 455. Downy Mildew on Grape Foliage	1317
Fig. 456. Powdery Mildew on Grapes	1318
Fig. 457. Powdery Mildew on Grape Foliage	1319
Fig. 458. Dead-Arm Disease on Grapevine	1321
Fig. 459. Vines of <i>Vitis Vinifera</i>	1332

	PAGE
Fig. 460. Secretary — Secured by Crossing Clinton and Muscat Ham- burg	1333
Fig. 461. The <i>Vinifera</i> Vineyard	1334
Fig. 462. Muscat Hamburg Grape	1335
Fig. 463. Clinton Grape	1337
Fig. 464. Orchard of 2,200 Trees Interplanted with Strawberries.....	1344
Fig. 465. Herbert Red Raspberry	1354
Fig. 466. Cuthbert Red Raspberry	1357
Fig. 467. Kansas Black Raspberry	1361
Fig. 468. Gregg Black Raspberry	1364
Fig. 469. Snyder Blackberry	1372
Fig. 470. McDonald Dewberry	1375
Fig. 471. Red Cross Currant	1383
Fig. 472. Currants on Farm of William Hotaling.....	1384
Fig. 473. Downing Gooseberry	1392
Fig. 474. Industry Gooseberry	1394

THE PEAR

"..... *the juicy pear*
Lies in soft profusion, scattered round."

THOMSON

[989]

VARIETIES OF PEARS FOR EASTERN NEW YORK

J. R. CORNELL, NEWBURGH, N. Y.

Ex-president, New York State Fruit Growers' Association

The financial success or failure of orchards of the various tree fruits is in a large measure due to the selection of the right or wrong varieties, as many who have made a poor selection or who have received misbranded trees from the nurseryman have learned to their sorrow.

For commercial purposes, few varieties are needed. While this statement will apply to all orchard fruits, it has special force in reference to the pear. From many years' experience in growing and testing over fifty varieties, I have finally eliminated all but three — Bartlett, Seckel, and Bosc. I might mention here that I have grown the Kieffer only in a testing way; while a success with me, the other varieties mentioned are more desirable from every standpoint. The Kieffer is in a class by itself, as it is used exclusively for culinary purposes. It is largely grown in the Hudson Valley, especially in the upper portion on the warmer sandy soils, and is esteemed by some as their profitable variety.



FIG. 286.—KIEFFER PEARS. THOSE AT LEFT AVERAGE 17 OUNCES, WHICH IS TOO LARGE; THOSE AT RIGHT AVERAGE 9 OUNCES—A DESIRABLE SIZE.

I consider the following the four best commercial varieties for eastern New York: Clapp's, Bartlett, Seckel, and Bosc. To this list might be added Sheldon, and, if a winter variety is desired, Clairgeau and Winter Nelis. There is a limited demand for winter pears, yet some find them profitable.



FIG. 287.—BARTLETT PEARS

I shall briefly present the strong and the weak points of the varieties mentioned.

CLAPP'S FAVORITE

Clapp's, or Clapp's Favorite, as it is more frequently called, has all the qualifications for a good market variety. The fruit, being of large size, handsome appearance and good quality, is popular in the markets. The tree is a strong grower, absolutely hardy, and a free and regular bearer. The fact that it is the first desirable variety to mature, being about two weeks earlier than the Bartlett, would seem to leave nothing to be desired as a commercial sort. The one great drawback is blight. I know of no variety in which blight control is more difficult. On well-drained soil, if not overstimulated, close attention may largely overcome this trouble.

BARTLETT

The Bartlett is preeminently the great commercial pear, being well known and popular in all the markets of this country, as well as abroad. Under good care this variety succeeds on all soils, from sand to clay, provided said soils are drained either naturally or artificially, for it goes without saying that no fruit tree will thrive with wet feet. I am not familiar with any variety that adapts itself so well to different soils, unless it be the Kieffer. Given good care, the Bartlett is a regular and profuse bearer of beautiful fruit. In the orchard the tree is a free and upright grower, and comes into bearing at an early age. It has a strong tendency to overbear, which should be corrected by severe thinning; otherwise there is a liability to exhaustion and dwarfing of the tree. The Bartlett is rather subject to blight, but yields more readily to control measures than does the Clapp's. All things considered, it is the most valuable commercial pear we have in eastern New York, or, for that matter, in this country.

SECKEL

In the Seckel we have the standard of excellence, and few indeed are the lovers of fruit who do not appreciate this delicious pear. Despite its small size and not very attractive appearance, it is popular and in good demand in the markets. Well-grown specimens of this variety command top figures, as a rule. This

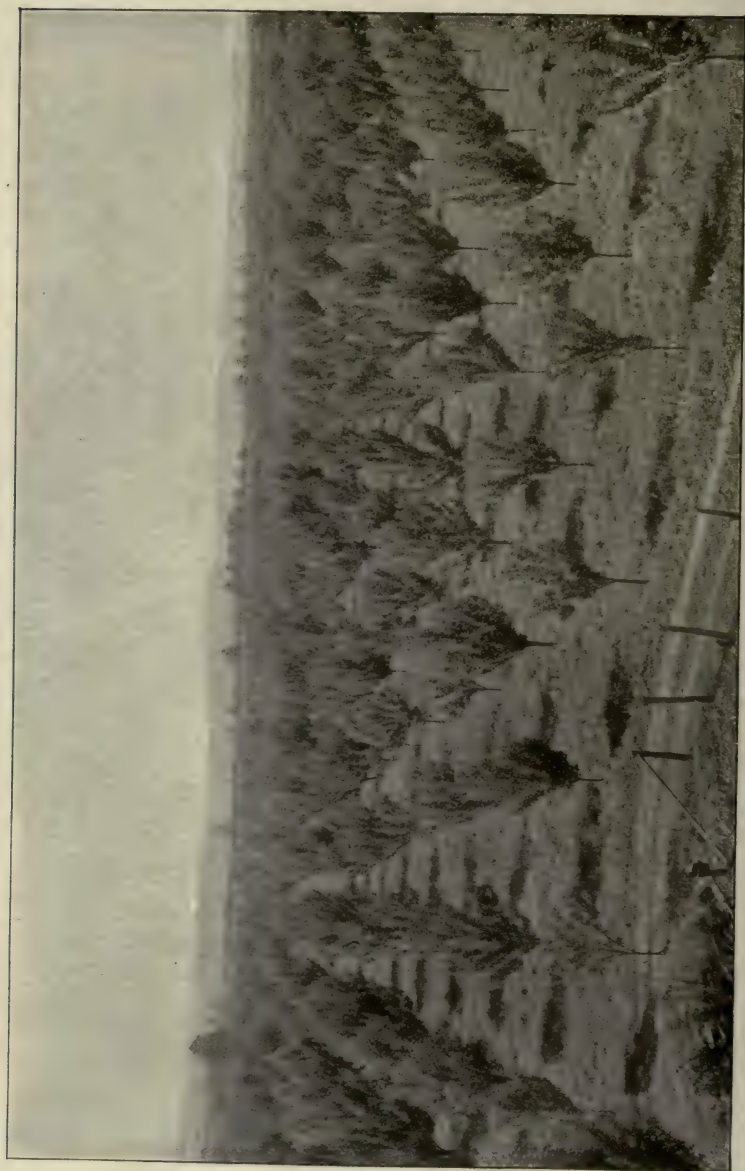


FIG. 288.—BIRDSEYE VIEW OF YOUNG KIEFFER ORCHARD ON FARM OF L. L. MORRELL, KINDERHOOK, N. Y.

variety is grown to more or less extent throughout the Hudson Valley. It is at its best on the warm silt loams and shales of this section. My experience is that it does not succeed so well on heavy soil or clay, failing to be productive, and the fruit lacking in style and color under these conditions. The tree, while growing somewhat more slowly than the Bartlett at the start, eventually makes a larger tree, although it is later coming into bearing. While not blight-proof, it is freer from the ravages of this scourge than any of the commercial varieties. It has a tendency to overload one year, being barren the next. In this respect it parallels the Baldwin apple. A deficiency of foliage is sometimes apparent when climatic conditions are unfavorable.

BEURRE BOSC

The Bosc pear, while an old variety, is comparatively new as a commercial sort. Only within the past few years has it assumed



FIG. 289.—THE BEURRE BOSC PEAR

any importance in the New York market, but at the present time no variety is in greater demand. Its large size and fine appearance, in connection with its superb quality — ranking well up to the Seckel in this respect — should naturally commend it to the discriminating buyer.

The tree seems to be difficult to grow in the nursery, and the planter is apt to be disappointed (unless familiar with this variety) when he receives his stock. After it is established in the orchard it is a free grower — in fact it might be termed a rapid grower. Its tendency to twist and curl its limbs can be corrected by judicious pruning. It succeeds admirably on a heavy soil, although good results are obtained on a medium loam. Results are not satisfactory on light soils. In the orchard the tree comes into bearing at an early age and is quite uniformly an annual bearer. It has the good habit of thinning itself severely, being unique in this respect, as I know of no other variety that possesses this trait. A good quality that should not be overlooked is the tenacity with which the fruit clings to the tree, being important during a high wind.

I know of but one weak point with this variety, namely, blight. Blight is more difficult of control on the Bosc than on the Bartlett, Bosc being in this respect not much behind Clapp's, especially the young trees. Although this is the only drawback to the variety, still it is a serious one.

SHELDON

To a large degree, the high quality of the Sheldon pear has maintained its position as a commercial sort; but, maturing at about the same season as the Bosc, it looks as though it will eventually be supplanted by the latter variety. In the orchard the tree is a good, strong, upright grower. One of its weak points commercially is the appearance of the fruit, which is apple-shaped and devoid of color; another fault is that when ripe it will not stand up. However, for the home collection this variety should always be included.

BEURRE CLAIRGEAU

The Clairgeau comes in the class of late fall or early winter varieties. I look upon it as the best commercial pear of its season. While not of high quality, when well grown it is very acceptable

as a dessert fruit. The tree is everything that can be desired — a fine grower, having strong foliage, free from blight, and an early and profuse bearer. It must be thinned to prevent overbearing, also to obtain size of fruit. Specimens of this variety sometimes weigh a pound each.

The great drawback to this variety, especially in a dry season, is the dropping of the fruit. When the fruit is near maturity, a high wind is likely to put the bulk of it on the ground. This necessitates planting in a sheltered position. Market values, while not so good as for the other varieties mentioned, are fairly satisfactory.

WINTER NELIS

Winter Nelis is the only winter pear to be considered in this section for market. It ranks among the late varieties with the Seckel among those of the early fall. The tree, like the Bosc, is a poor grower in the nursery, but makes good in the orchard. Although a straggling grower, it is healthy, hardy, and productive.

I have had better pecuniary results from the autumn varieties; but, where one has a market for a late pear, the Nelis should give good satisfaction.

There have been a number of varieties recommended by the nursery interests for commercial planting. I will mention only two here, namely: Anjou and Worden Seckel.

BEURRE D'ANJOU

The Anjou has been planted rather extensively in years past — in fact it would be somewhat difficult to find an orchard of mixed varieties where it was omitted. Despite its wide distribution, giving it the advantage of various locations and conditions, it has failed to make good its claims for commercial purposes in eastern New York.

I will briefly mention its shortcomings as I found them. It is very unreliable about bearing. If conditions are unfavorable at the blooming period, it will not set fruit to any extent. It suffers more from a wind storm than any variety I know of, Clairgeau not excepted. It is not a good seller in the market, its thin skin and lack of color being against it. Nevertheless, it is a

good fruit, and should not be omitted in the home collection. The tree is a strong, vigorous grower, and is not excelled in this respect by any in the entire list.



FIG. 290.—THE ANJOU PEAR

WORDEN SECKEL

I must confess that I have been greatly disappointed in the failure of the Worden as a market variety, while this also is a good pear, and should be in the home collection. It is a fruit of great beauty, high quality, good size, and certainly in the package is the showiest of all; but, despite these facts, so far it has failed to meet the popular demand. Time may change conditions, but commercially we can hardly afford the attempt to educate the popular taste. This variety is a good grower, and an early and profuse bearer. It should be severely thinned to have good results.

OTHER VARIETIES

The Comice as it comes from the Pacific Coast is a good commercial pear, but my experience with it so far would not justify including it in the list for eastern New York.

As I stated in the beginning of this article, three varieties are all that I should use for a commercial orchard; namely, Bartlett, Seckel, and Bosc, and I esteem them all of equal value for the purpose.

For the home orchard a wide scope may be given as to varieties. The first pear of any value to ripen is the Doyenné d' Eté, but the first really good one is Manning's Elizabeth, followed by the Tyson. The Tyson should be included in every list for the home orchard. I have yet to see a pear tree that equals this variety in hardiness, healthfulness, and vigor. If there is such a thing as a blight-proof pear, it is the Tyson. The tree grows to a large size and produces abundantly, and its fruit is in season for a long period. While this variety responds to good treatment, it will stand more neglect than any other.

Lawrence is a desirable late fall pear, maturing before the Winter Nelis. The fruit is of high quality and the tree is desirable in every respect. A most excellent variety for the home orchard.

Dana's Hovey is the highest quality of any of the late pears, ranking with Seckel in that respect. Despite its small size, it has a commercial standing in the Boston markets.

The list of good pears is a long one, and I have endeavored to mention only a few that should prove satisfactory to the home orchard. There is no reason why, with a proper selection of varieties, this delicious fruit should not be available over the larger period of the year.

VARIETIES OF PEARS FOR WESTERN NEW YORK

IRA PEASE, OSWEGO, N. Y.



In general, varieties of pears that have long, slender stems will hang on the tree much better than those with short, thick stems; also, trees with long, slender limbs will hold the fruit better than stocky trees. This is because the trees and fruit sway in wind instead of jerking. In a commercial way this is more important with pears than with apples, for there is very little market for windfall pears,

while there is a good market for windfall apples.

In selecting varieties, it is also well to consider whether they are more than ordinarily subject to blight. I am giving my own experience with these varieties at Oswego.

CLAPP'S FAVORITE

Clapp's Favorite is of best quality and is very popular with the consumer for eating out of the hand. Fruit is large, luscious,



FIG. 291.—CLAPP'S FAVORITE.
[1000]

handsome — yellow with red cheek. Tree sprawling and rapid grower; bears young, annually, and abundantly. This variety takes blight more easily than any other and it will run through the tree more quickly; however, if blight is checked, the tree will recover quickly — all because the tree makes such a rapid growth. It is a good variety for the grower to gamble on — he may make well and he may lose the whole orchard before it comes to bearing. On the whole it is a very profitable pear to grow and sell before Bartlett's. It is generally considered too soft for canning.

BARTLETT

Bartlett stands at the head of the list for amount of production and demand, and generally for profit. It is a good bearer from youth to old age, brings as good a price in the general market as any, and is better known than any other variety — so well that it is in great demand by the general public as well as by the canners. Usually, it does not require a great deal of thinning, although this should receive attention. Bartlett is not so badly infested by fungus of the fruit as are some other varieties. It is harvested at a time when we can procure plenty of extra help, before apple picking and the hurry of fall work. It has one bad trait — the tendency to blight — which is very serious.

SECKEL

The Seckel is very superior in quality and bears well after the tree is mature, if in deep, fertile soil. It does not take blight very readily and blight runs slowly through the tree. Tree is well shaped and ornamental, but, on the other hand, is late in maturing and coming into bearing. The Seckel is a small pear, and for that reason cost of picking per bushel is double as much as the larger varieties. It requires more fertilizer, more labor in thinning, more spraying for fungi. There is very little, if any demand for it by canneries, and it is not so well known as Bartlett. My experience is that Seckel on dwarf stock is more profitable than standard, as the fruit is larger and more easily picked, and the tree comes into bearing much sooner.



FIG. 292.—BRANCH WELL LADEN WITH SECKEL PEARS



FIG. 293.—PACKING BARTLETTIS, ORCHARD OF IRA PEASE, OSWEGO, N. Y.

BUERRE D'ANJOU AND SHELDON

These varieties have four traits in common: fruit of excellent quality; they sell well when well known; both drop very easily; both refuse to bear every year.

Many growers have trouble to make Anjou bear at all. It seems to require especially severe pruning. Anjou is comparatively free from blight; Sheldon blights worse than Anjou, but not so badly as Clapp's and Bartlett. Anjou tree is a large, strong healthy grower, somewhat spreading in habit, while Sheldon grows up tall without spreading so much.

KIEFFER

Quality poor for eating out of hand, but excellent for canning or cooking. Many people who have Bartlett and Kieffer prefer the latter for canning. To me they are no more alike after being cooked than peaches and Bartletts. The fruit is large and handsome if well thinned; the trees are very strong and rapid in growing, and have long, flexible limbs. Kieffer has eight good

points: it grows quickly; has long, strong, flexible limbs; does not take blight readily; bears young; bears every year; bears very abundantly; handsome fruit; excellent for canning. The disadvantages are: low price of fruit; requires severe thinning of fruit.



FIG. 294.—KIEFFER TREES ON FARM OF L. L. MORRELL, KINDERHOOK, N. Y.

Up to the time of picking I have no doubt but Kieffer can be produced for one-fourth the cost of other pears.

BEURRE BOSCH

The fruit is of excellent quality, and if tree is well fertilized, of large size. Some claim to have a superior strain which grows larger than the ordinary Bosc, but I think that if there is a difference it is due to treatment and culture. It has a russet skin, rich yellow when ripe; long stem; tree has long, drooping branches and requires top-working; not a very strong grower; does not blight so badly as Bartlett; bears every year and abundantly. Fruit ripens in October and sells for highest prices, making Bosc a very profitable variety for the large orchardist. Planting near another variety may be necessary to fertilize the blossoms.

BEURRE CLAIRGEAU

Clairgeau is a large, handsome, late pear of very poor quality, inclined to be knotty and corky in flesh. It has a short, thick stem and drops badly. The tree is a strong grower and does not blight badly. I should not recommend it for profit. An honest man would not want to market this pear, for it deceives the consumer.

LOUISE BONNE DE JERSEY

This is an excellent autumn pear, keeping into winter. Fruit of best quality; russet, yellow, red cheek; medium size. It bears well on dwarf stock.

DUCHESS D'ANGOULEME

The fruit is large, coarse-grained, not best flavor, and sells for low price in general market. It is usually grown on dwarf trees. It has been a money maker where produced in large quantities in western New York, but has not been a success with me.

WINTER NELIS

Nelis is a medium-sized, green russet, winter pear of best quality. It has a long stem and hangs on tree well. The fruit is not very handsome, but looks good to those who know the quality. Probably it is not so profitable to grow as some varieties, but for best prices should be sent to a special market where known.

WORDEN SECKEL

This variety is much larger than Seckel; not so sound, but much handsomer. Color, yellow-brown with red cheek. Stem longer than Seckel; hangs well to tree. Quality not so good, being a little softer. Fruit inclined to crack. It is an excellent variety, but as yet not much known in a commercial way.

FOUR ADDITIONAL VARIETIES

The four following varieties are barely worth trying:

Tyson. Medium to small; rather soft; sweet, but not much flavor. Tree vigorous.

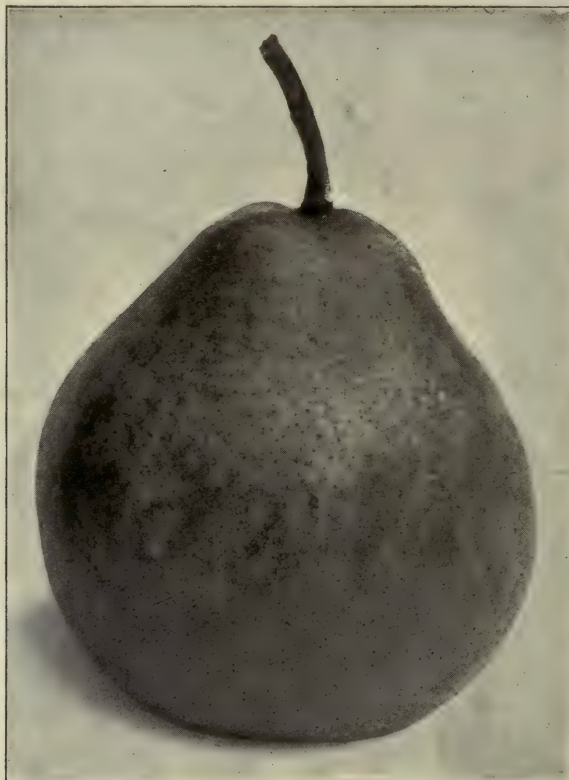


FIG. 295.— WINTER NELIS PEAR

Flemish Beauty. Large, round, green, with red cheek; yellow when ripe. Rather coarse grain; fair quality; fruit cracks, and is badly troubled with fungus. Perhaps if sprayed a great many times it might be kept clean, but it does not bring high prices. It produces enormously. The tree is a rapid, large grower and blights very badly.

Vermont Beauty. Medium size; green and yellow with bright red cheek; very glossy as if varnished; sweet, but not very much flavor; rather soft. Much inclined to overbear and needs severe thinning; hangs to tree well; blights somewhat easily.

Lawrence. Medium size; bright green, yellowing when ripe; only fair flavor. It is a winter variety and bears well, but sells at low price in general market.

CULTURAL METHODS FOR PEARS

IRA PEASE, OSWEGO, N. Y.

A pear orchard set on a hill or a sidehill where drainage is good, sloping toward a body of water, is preferable. No slope should be so steep as to make spraying impracticable. Lowlands should be avoided, and a southern slope is not so good as some other, because buds start too soon in the spring. The land should be well and deeply underdrained.

WELL-MATURED TREES AND DISTANCE OF PLANTING

The trees should have good roots and well-matured tops. Trees with soft, green tops, though they may be large, should be avoided.

Standard pear trees should be set not less than twenty feet apart. Seckel, Anjou, Flemish Beauty, Kieffer, and other large-growing varieties may be set at greater distance with profit. Trees that are not very much subject to blight will usually attain a larger size than those that are. Of course dwarf trees may be set nearer together, but trees on dwarf stock often throw out roots from the pear part of the tree above the union and become standard trees and grow to full size.

CARE IN SETTING

In setting trees, care should be exercised to pack the earth under the roots, as well as on all sides and on top. After thoroughly packing the earth, throw on the surface an inch or two of loose earth for a mulch to retain the moisture. Water may be applied if very dry, but mulching with earth should follow the watering. In order to get a good growth, the trees should start at once after being set. This refers to spring setting.

Cut off all the branches which are less than three feet from the ground when setting. With Bartletts, Clapp's, and Sheldons, or any variety inclined to shoot up tall and slender, shorten the remaining branches. Seckel, Anjou, and varieties that make a round, stocky head should be trimmed to a whip; that is, all side branches should be taken off.



FIG. 293.—SUTTON BEAUTY ORCHARD ON FARM OF L. L. MORRELL, WITH PEARS AS FILLER

PRUNING

After the first year, prune very little — only for shaping the tree a trifle or to remove blight. Much pruning will retard coming into bearing. All sprouts and suckers on the trunk and large limbs should be removed promptly when they first appear, so that if blight strikes the tree it will not be carried into those parts. If the smaller limbs blight they may be removed without so much loss to the tree.

When an orchard is in full bearing it usually requires some thinning of the branches to admit light and produce larger and better fruit. Some varieties — for instance, Anjou and Kieffer — require especially severe pruning. Anjou needs pruning to make it bear heavily, as well as to increase the size and quality of the fruit. Some orchardists practice cutting their Kieffers as severely as they do their grape vines, taking off nearly all the new growth each year.

When an orchard is very old and the limbs have become brittle, it is well to renew by cutting off some of the old limbs and allowing new shoots to make the tree.

INTERCROPPING

It is not profitable to grow pears and grass or grain on the same ground. Other crops may be grown if cultivated, though the digging of potatoes in the early fall will sometimes start a late, soft growth, which is more liable to winterkill or to be affected with blight the next season. When the trees are nearly large enough to cover the ground, it is not usually profitable to plant other crops among them. The ground should be plowed and harrowed in the early spring, and cultivation continued until the cover crop is put on.

COVER CROPS

A cover crop is quite important to save fertility and check an excessive late fall growth of the trees. Weeds will do for a cover crop, although after good summer cultivation they are usually not thick enough unless sown. Vetch, barley, clover and turnip is a good combination, if it will catch and grow. Rye and vetch

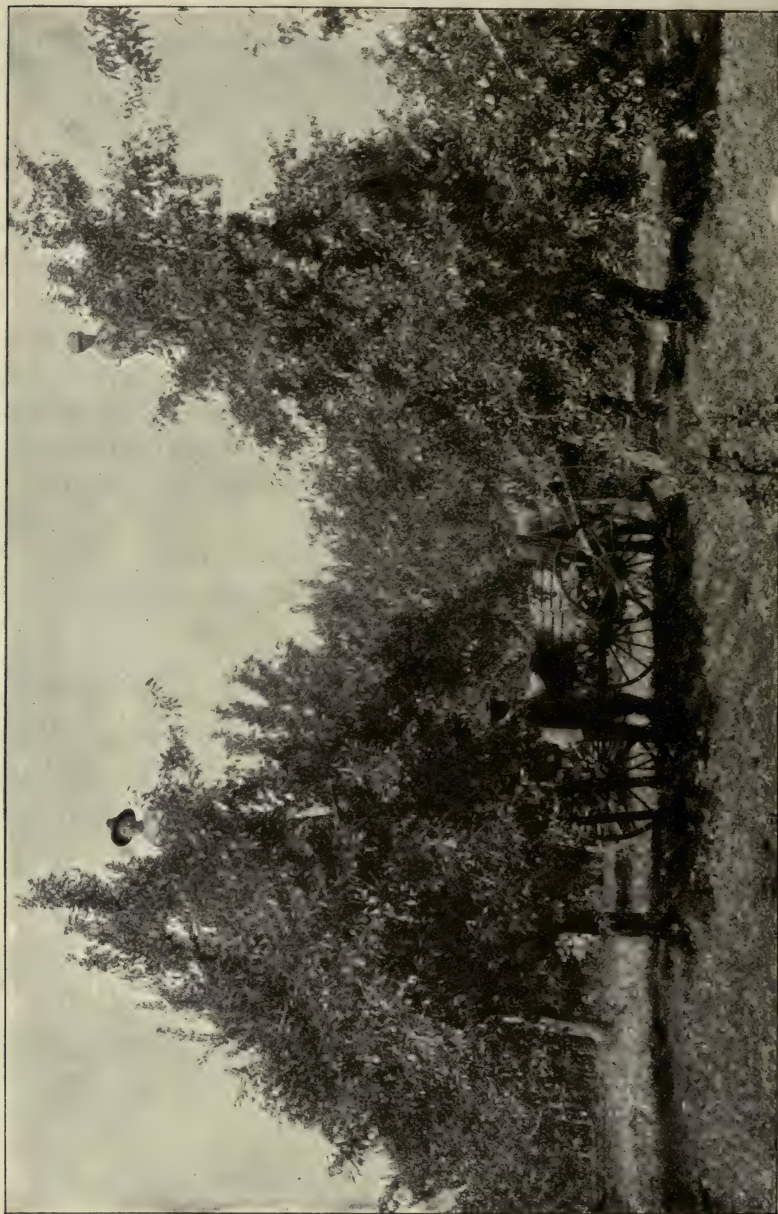


FIG. 297.—DRAWING TO TABLE. ORCHARD OF IRA PEASE, OSWEGO, N. Y.

is surer to grow, and gives more humus. Vetch and turnip will reseed themselves from year to year if a few plants are allowed to grow.

PEAR BLIGHT

Blight spreads much faster when the trees are growing rapidly and the tips are very green and soft. For this reason, if there was an abundance of rain and the trees are growing fast in June, I would sow the cover crop and stop cultivation, in order to retard the growth and help check the blight. Ordinarily, however, if the trees carry a heavy crop of fruit, or if the weather is very dry, it would be better to cultivate as late as the latter part of July or into August.

So far as I know, nothing new has been learned of blight for the past five years. For cause and treatment read Cornell Bulletin No. 272 on blight of pears.* Many may think such treatment is not practical, but I believe that I have kept blight in check and that it pays well. Certainly, in a young orchard where the branches may be easily reached, I should follow this treatment, inspecting and cutting very thoroughly during the growing season.

It is very difficult to see all the blight in a tree in passing, on account of the shadows, but if one inspects a certain part of the orchard in the forenoon, and at the next inspection visits these trees in the afternoon, his work will probably be much more thorough, for he will have light in the afternoon where there was shadow in the forenoon.

INSECT ENEMIES

If the trees have San José scale, use a strong solution of lime-sulphur when trees are dormant. For codling moth, use arsenate of lead after the blossoms fall. For fungous troubles it is better to combine arsenate of lead with bordeaux than with lime-sulphur.

I do not as yet know how to treat pear psylla effectively.† We have used the methods recommended by the Geneva Station and they admit we were thorough. We sprayed early in the spring

* See article on page 1039, by Professor M. F. Barrus.

† See article on pear insects by Professor P. J. Parrott, page 1019.



with nicotine to kill the old flies, and again with full scale strength lime-sulphur after the blossom buds had separated to kill the eggs. We killed a large percentage of both flies and eggs. After the nymphs were hatched we sprayed again with nicotine, but still we had a great many psylla. We killed many of the blossoms and seriously reduced the crop of pears with the lime-sulphur spray. Two of my neighbors had nearly the same experience. The psylla is our worst pest.



PRUNING PEAR TREES

ARTHUR FARRAND, "THE PINES," HUDSON, N. Y.

FUNDAMENTAL PRINCIPLES



There is nothing more important in the growing of pears than the proper pruning of the trees, and if they are not thus pruned one cannot expect to secure a fine quality of fruit. From my observations, this important matter has been greatly neglected; however, more attention is now being given each year to the care and pruning of pear trees, and the results are apparent by the large size and fine quality of pears that are grown.

It is well, however, to remember that pear trees do not require so much pruning as many other varieties of fruit trees, because they are more naturally of dwarf habit. The spurs of pear wood bear the fruit, and little or no pruning is necessary after they develop.

PRUNING FOR A PURPOSE

However, there are a great many orchards that have not been pruned for years, where careful pruning should be done, avoiding the removal of too much wood from the trees the first year, as it would be so much of a strain on their vitality as to make them very susceptible to disease.

Most fruit growers know that pruning is done to remove dead wood, to take out crossing branches, to shape the tree well, or to insure better fruit. Tree butchers have prejudiced the amateur, but intelligent and proper pruning may be done by anyone who will pay strict attention to a few simple principles, at the same time using common sense.

All dead wood and useless branches should be cut out of the tree first. When the growth of one branch will injure another by rubbing or crowding it, sacrifice the weaker branch. Shoots

which grow on the inside surfaces of the main branches, and also on the trunk of the tree, should be removed. These are commonly called suckers, and they absorb much of the life blood of the tree that would otherwise go into the fruit-bearing wood.



FIG. 300.—WHEEL LADDER FOR PRUNING TREES OR PICKING FRUIT, USED BY L. L. MORRELL, KINDERHOOK, N. Y.

WINTER PRUNING PREFERABLE

We prefer late winter rather than autumn for such work, because the trees are then dormant, and also because a severe winter will often kill back the branches below the cut, thus involving a repetition of the work. Pruning should never be done in freezing weather, nor should it be left until the sap has swelled the buds, as in either case a serious loss of vitality will result.

METHODS

When pruning involves the removal of a large portion of the annual growth, which is quite necessary in the Kieffers, it is well to remember that the cut should be made immediately above a bud; if made below or between buds, that portion left very often dies back to the bud, leaving a decaying stem which may prove a direct injury.

It is also a good plan in removing large branches to cut twice, making the first cut at least a foot above the point selected, to prevent the wood from splitting down and tearing off the bark. After the first cut has been made and the weight of the branch removed, a second cut is made, holding the stub until the cut is completed; this prevents the splitting and tearing off of the bark which is likely to result from careless removal of large branches. All wounds should be left smooth, as the healing process will start much more quickly than if a jagged surface is left.

PROTECTING WOUNDS

Many fruit growers and tree surgeons paint the exposed surfaces of a tree or a limb after pruning with tar, white lead, shellac, or ordinary paint; although many practical tree men use no covering whatever. We have had excellent results from both systems.

PRUNING FOR BLIGHT

It is well known that pear trees are subject to blight, and when it is discovered no time should be lost in cutting out the diseased wood, at least eight inches below the infected part. All infected branches and twigs should be immediately gathered and burned,

and the wound of the tree disinfected with a solution of corrosive sublimate. Each tablet contains the requisite amount when added to a pint of water, to make a solution 1-1,000, which is the strength we have used for years, and which has always been effective.

It is also important to disinfect with above solution the tools strength we have used for years, and which has always been effective.

SOME INSECTS ATTACKING THE PEAR, AND THEIR CONTROL

P. J. PARROTT

Entomologist New York Agricultural Experiment Station, Geneva, N. Y.



The pear is subject to attack by many of the insects that are injurious to the apple. As is characteristic of all fruits, however, there are certain pests peculiar to it or to which it displays an unusual degree of susceptibility — as the pear psylla, the sinuate borer, or the pear thrips. The more injurious species to be considered in the upkeep of a pear orchard may be classified in the following order:

Insects attacking the trunk and branches.—Sinuate borer, round-headed borer, flat-headed borer.

Insects incrusting the bark. San José scale, oyster-shell scale, scurfy scale.

Insects attacking the blossom buds and fruit.—Codling moth, false tarnished plant bug, pear midge, pear thrips, plum curculio, bud moth, leaf rollers, green fruit worms.

Insects attacking the foliage.—Pear psylla, pear slug, blister mite.

INSECTS THAT ATTACK THE TRUNK AND BRANCHES

The Sinuate Borer

The sinuate borer, *Agilus sinuatus* Olivier, which is of European origin, appears to be confined to five or six fruit-growing counties contiguous to the Hudson River in the southeastern part of the state. Its ravages have been of such a character that it has almost discouraged the planting of pears, and it now promises to exterminate the orchards that were established before its appearance in that region. The adult insect is a small copper-colored beetle about one-third of an inch long. It makes its appearance during the forepart of June and deposits its eggs in depressions or crevices in the bark of the trunk or branches. Upon

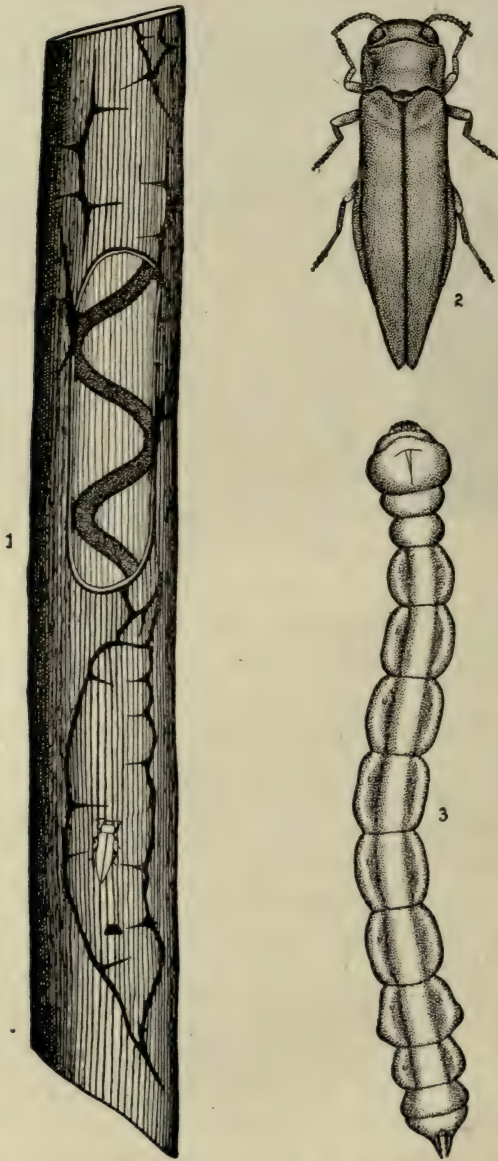


FIG. 301.—THE SINUATE BORER: (1) WORK OF BORER IN BARK;
(2) ADULT; (3) LARVA

hatching, which occurs about the first of July, the young larva burrows directly from the egg to the sapwood, where it cuts an irregular serpentine mine that is very characteristic and easily distinguishable from the work of other borers attacking pear trees. The girdling of the bark kills the trees or weakens them so that they lapse into a languishing state and become unproductive.

Treatment. Wood-boring insects are generally difficult pests to combat, and this beetle in particular presents a series of difficulties not usually encountered in a single species. For small trees perhaps the most satisfactory method of control is to cut into the mine of the insect and destroy the inmate. The course of the mine can usually be traced by the discoloration and splitting of the bark following the tunneling by the borer. Recent studies have shown that the beetles feed readily on the foliage, and they point to the possibility of successfully controlling the insect by an application of an arsenical spray during the latter part of May, or shortly before the beetles begin to appear. Worthy also of trial during early June is an application of a deterrent wash to the trunks and branches in order to prevent oviposition. For bearing orchards the latter measures are recommended tentatively, pending the results of our experiments to determine their merits.

The Round- and Flat-headed Borers

The round-headed borer, *Saperda candida* Fab., and the flat-headed borer, *Chrysobothris femorata* Fab., are very destructive pests to different fruit trees, including the pear, and they do more damage than the average grower appreciates. The injuries are caused by the grubs, or larvae, that work beneath the bark. If the burrows or channels of the insects are numerous, the bark may be girdled, resulting in the decline and death of the trees. Recent investi-



FIG. 302.—THE ROUND-HEADED APPLE-TREE BORER

gations have also shown that insects play an important role as disseminators of diseases. It is now believed that various wood-boring insects are in part responsible for cankers and other disorders of the trunks of fruit trees. The wounds and holes in the bark produced by these pests certainly make it possible for disease-producing organisms to establish themselves in the tree.

The adult round-headed borer is a handsome beetle about three-quarters of an inch long and light brown in color, with two white stripes across thorax and along each wing. The adult of the associated species is a dull metallic brown in color and about one-half inch in length. The life histories of the two insects are very similar. The eggs are deposited in crevices or slits in the bark, and from these there develop the pale grubs, which may be observed working beneath the bark and which are familiar to most growers.

Treatment. The trees, especially in young plantings, should be inspected every fall and spring for discolored areas in the bark or for wounds from which there is exudation of sap or for sawdust-like castings. When such are detected the borers should be cut out by means of a strong, sharp knife. Grubs buried deeply in the heartwood may be destroyed by probing with a piece of wire or by injecting carbon bisulphide into the burrows, after which the openings should be immediately sealed with grafting wax. As unthrifty trees are more susceptible to attack, the needs of the orchard in other respects should be given careful attention for the purpose of stimulating the trees to outgrow the injuries and ward off subsequent attacks.

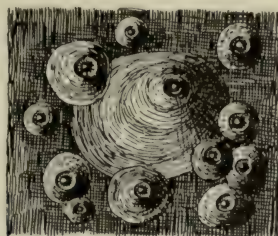
INSECTS THAT INCRUST THE BARK

The San José Scale

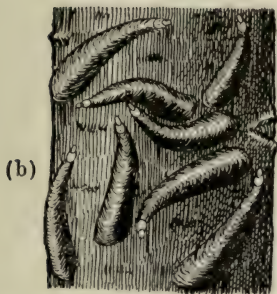
San José scale, *Aspidiotus perniciosus* Comstock, ranks as one of the worst pests of fruit trees. Besides the pear, it attacks the cherry, apple, peach, plum, currant — practically all our common orchard trees and bush fruits. It thrives also on many shade trees and ornamental shrubs.

Large numbers of this scale appear as a grayish, scurfy deposit, not unlike a coat of ashes. The bark becomes rough and dull instead of having a smooth and polished appearance. Branches that are infested with large numbers of the insect usually show dead

twigs, and foliage is sparse. Infested leaves are often marked with red or purplish spots. The pears are rough, scabby, and spotted with red; the reddish discoloration being most noticeable around the margins of the scales. The wonderful power of reproduction of this species makes it the most formidable of our orchard scales.



(a)



(b)



(c)

FIG. 303.—COMMON SCALE INSECTS (Much enlarged). (a) SAN JOSÉ SCALE, (b) OYSTER-SHELL SCALE, (c) SCURFY SCALE

Treatment. To combat San José scale the grower should apply lime-sulphur solution late in fall or preferably in spring just before the leaves begin to show. The concentrated solution, testing from thirty-two to thirty-four degrees Baumé, should be diluted in the proportion of one gallon to eight or nine gallons of water. Commercial miscible oils diluted with twelve or fifteen parts of water are used with considerable success by some growers. These preparations should be applied in spring while buds are swelling.

The Oyster-Shell Scale

Oyster-shell scale, *Lepidosaphes ulmi* Linn., appears as a brown scale about one-sixth of an inch long, closely resembling the bark in color and somewhat like a long, narrow oyster shell in

shape. In some seasons the insects appear in such numbers that twigs and branches are literally covered, in which event the health and vigor of the trees are seriously impaired. This species is commonly found on pear and apple, although it attacks many other plants.

The Scurfy Scale

Scurfy scale, *Chionaspis furfura* Fitch., somewhat resembles the oyster-shell scale, but is easily distinguished from it by its greater breadth and white color. When present in large numbers it is conspicuous by its contrast with the dark bark. It is common on pear, apple, and quince.

Successive years' spraying with the lime-sulphur mixture as indicated for San José scale will also free the trees from oyster-shell scale and scurfy scale. About the middle of June, as the young scales hatch, the latter species may also be efficiently controlled by applying one pound of fish-oil soap dissolved in five gallons of water, or kerosene emulsion diluted with eight parts of water.

INSECTS THAT ATTACK THE BLOSSOMS AND FRUIT

The Codling Moth

The codling moth, *Carpocapsa pomonella* Linn., is responsible for wormy pears. The damage to the fruit is done by a worm, or caterpillar, of a small moth, popularly known as the codling moth. There are two broods of worms. The first brood appears in early summer, while the second brood is active during late summer. The worms of the first brood are hatched from tiny dislike eggs, laid on the trees by the parent moths, on or near young pears. Two or three weeks after the trees have blossomed, the eggs hatch. The young worm crawls to the blossom end of the pear and burrows into the interior of the young fruit, feeding as it goes. After feeding for two or three weeks, the worm leaves the pear and spins a cocoon under the rough bark of the trees or under adjacent rubbish. Within this cocoon it changes to a pupa, and later to a moth, which is the codling moth of the second brood. In the latitude of Geneva the second brood of moths appears during the latter part of July or early August. During some seasons, the late brood of worms is rather numerous and is responsible for

the increasing numbers of wormy fruit as the time of picking approaches. These late worms spend the winter in cocoons as described and do not transform to moths until spring, after the trees have blossomed.



FIG. 304.— THE CODLING MOTH: (a) WORK IN APPLE; (b) MOTH

Treatment. Nearly all the codling-moth worms seek the blossom, or calyx, end of the young pear, where they feed before borrowing into the interior. The object in spraying is to coat this portion of the young pear with poison so that the worm may be destroyed at its first meal. The best time to apply the poison is after the blossoms have largely dropped and before the calyx cup closes. Direct the nozzles so that the spray will be shot into the throat of every blossom, or calyx cavity.

Arsenate of lead is recommended as it is extremely poisonous to the codling-moth worms and on drying is very evenly distributed. If it is properly made, it is the most adhesive of spraying poisons and does not generally cause burning of foliage. Bordeaux mixture is recommended as the carrier of this poison. Arsenate of lead should be employed in the proportions of two or three pounds to fifty gallons of water, or of bordeaux mixture, if it is desired to apply a fungicide.

The False Tarnished Plant Bug

The false tarnished plant bug, *Lygus invitus* Say, is responsible for a diseased condition of pears characterized by the cracking open of the skin in small spots and the formation of protruding granular areas. Fruits seriously injured are usually much

deformed and undersized. The damage is done by the nymphs that make their appearance during the period when the trees are coming into blossom and until pollination is completed when the young fruits are the size of filberts. A single nymph may stab a



FIG. 305.— THE FALSE
TARNISHED PLANT
BUG: NYMPH PUN-
CTURING A YOUNG
PEAR

pear many times, and while the initial wounds are at first slight and seemingly inconsequential, they nevertheless produce a disfiguration that becomes increasingly prominent as the fruit increases in size. All the leading sorts of pears are subject to injury.

Treatment Spray the trees with three-fourths of a pint of nicotine solution (40 per cent) to one hundred gallons of water, to which is added three pounds of soap to cause the liquid to stick and spread better. The application should be made just after the blossoming period or when petals are falling.

The Pear Midge

The pear midge, *Contarinia pyrivora* Riley, causes young pears to become stunted and deformed. The identity of the species is readily recognized by cutting into a young affected fruit, when tiny maggots will be observed working in and around the core. Eggs are laid by a tiny midge in the interior of the unopened blossom. On hatching the young larvae work their way to the ovary, and feed about the core. After completing its growth, the maggot abandons the fruit and enters the ground, where it remains until the following spring.

Treatment. No satisfactory means for the prevention of losses to the crop have been devised, and it is fortunate that the insect is of rather local importance. For the protection of a few trees it is desirable to collect and destroy by the middle of May all infested fruits, which may be distinguished by their size and shape. For commercial plantings the only recourse is frequent and thorough cultivation during June and July.

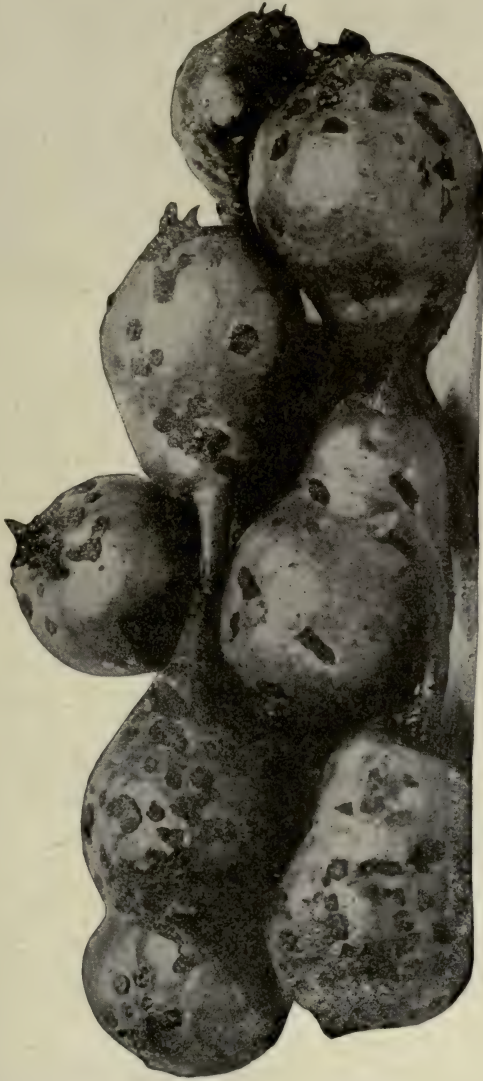


FIG. 306.—CLUSTER OF PEARS INJURED BY THE FALSE TARNISHED PLANT BUG



FIG. 307.— THE PEAR MIDGE: YOUNG PEARS DEFORMED BY LARVAE

The Pear Thrips

The pear thrips, *Taeniothrips pyri* Daniel, occurs in all the leading fruit-growing sections of the state. It is most injurious in

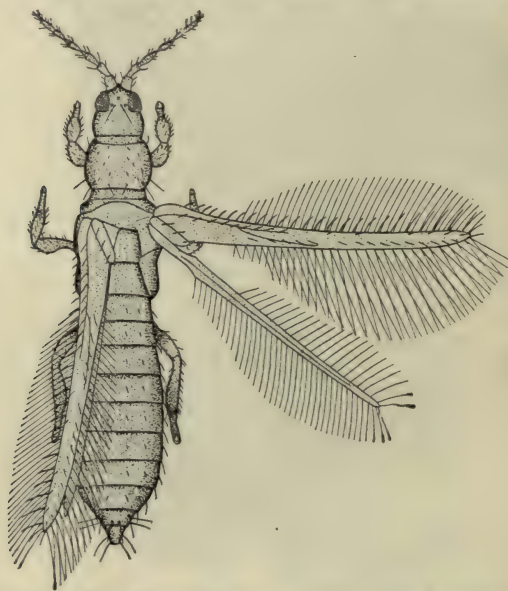


FIG. 308.— THE PEAR THRIPS: ADULT (much enlarged)

the Hudson Valley and has attracted the attention of growers generally in the localities of Germantown and Hudson. The adult thrips, which is largely responsible for the injuries to the

trees, is a small, darkish brown, winged insect measuring about one-twentieth of an inch in length. It appears in destructive numbers when the buds are opening, attacking the tenderest of the flower parts. While all fruits are subject to attack, pears of the varieties Kieffer and Seckel sustain the greatest damage. In severe attacks the trees are wet with sap that runs down the fruit spurs discoloring the bark, while bud scales, blossom bracts, and sepals of unopened blossoms become blackish or discolored. At time of full bloom trees severely injured appear as if struck by blight. The eggs are

FIG. 309.—THE
PEAR THRIPS:
EGGS (en-
larged)



mostly deposited in the blossom and fruit stems. Hatching takes place in a few days, and after feeding for about two weeks the larvae drop to the ground. In a protecting cell, the insect completes its transformations and emerges from the ground in spring as an adult.

Treatment. The thrips is a difficult pest to combat because of the nature and suddenness of its attacks. Spraying is the most efficient method of control. The period for effective spraying is during the time when buds are breaking and until they are entirely opened at the tips. The most efficient mixtures are nicotine preparations in combination with an oil emulsion or soap. A very satisfactory formula is three-fourths pint of nicotine solution (40 per cent) in one hundred gallons of water, adding from two to five pounds of soap. Apply the spray in liberal quantities as a rather coarse driving spray, holding the nozzle fairly close to the buds in order to force the liquid into the ends of the buds. When petals drop, the treatment should be repeated to destroy the larvae. Considerable protection may be afforded to the trees by a heavy application of a whitewash as buds are beginning to break at the ends. The whitewash is made

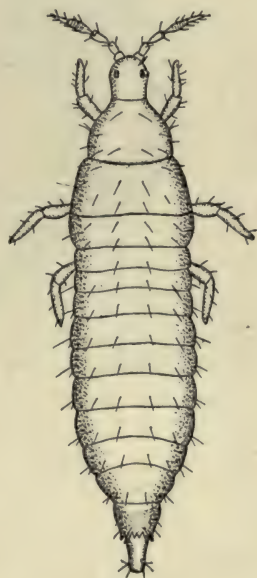


FIG. 310.—THE
PEAR THRIPS:
LARVAE
(enlarged)

The whitewash is made



FIG. 311.— KIEFFER BRANCH SHOWING BLIGHTING OF BLOSSOM CLUSTERS
DUE TO WORK OF THRIPS

by slaking eighty pounds of quicklime for each one hundred gallons of wash. This should be strained through fine brass screening before applying.

The Plum Curculio

The curculio, *Conotrachelus nenuphar* Herbst., causes deformed and knotty pears. It also produces holes in the maturing fruit that are often confused with the work of the codling moth. The

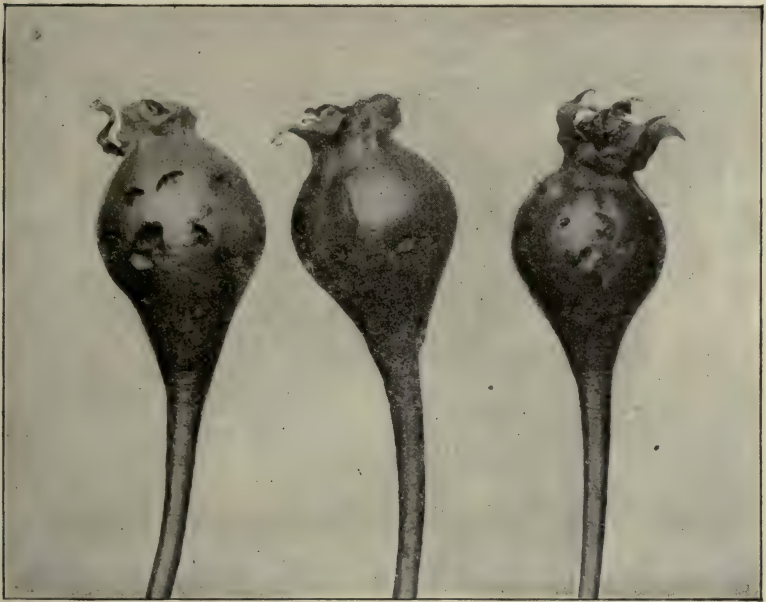


FIG. 312.—THE PLUM CURCULIO: YOUNG PEARS SHOWING FEEDING AND OVIPOSITION PUNCTURES

adult is a small gray beetle that passes the winter under the bark of trees or under rubbish. This insect appears early in spring and deposits its eggs in young fruits. The egg is inserted under the skin, after which a crescent-shaped cut is made around one side of the puncture. Egg laying continues for about two months.

Treatment. The plum curculio is rarely injurious to commercial plantings of pears in New York except where the orchard is adjacent to woods, brush land, or other favorable hibernating

quarters or to plantings of plums and peaches. The most effective means of combating this pest in pear and apple orchards are spraying with lead arsenate, clean cultivation, tillage, and destruction of windfalls. It is possible to reduce the numbers of the insects in nearby plantings of plums and peaches by jarring the plum or peach trees or by spraying with arsenate of lead just after blossoming. If the infestation is due to the close proximity of woods or waste lands, such places should be cleared of the underbrush or burned over during the winter so as to destroy hibernating insects.

The Bud Moth

The larva of the bud moth, *Tmetocera ocellana* Schiff., hibernates over winter under a tiny shelter on the young wood, and in spring attacks the opening buds. Later, when leaves and blossoms unfold, it seeks the clusters, forming a retreat in the webbed leaves. By reason of its destructiveness to buds and blossoms, the bud moth is a serious pest during some seasons. The caterpillar is darkish red in color and pupates in June. The moth makes its appearance about ten days later, and soon afterward eggs are deposited for the next year's brood. From these eggs caterpillars hatch that feed on the leaves until fall, when they seek sheltered retreats for the winter.

Treatment. Systematic spraying with arsenicals each year will control this species. The times for effective spraying are, first, as the buds begin to expand, and, secondly, when the leaves are fairly out.

The Leaf Rollers

The oblique-banded leaf roller, *Archips rosaceana* Harris, and the fruit-tree leaf roller, *Archips argyrospila* Walker, are native insects that feed on a variety of fruits, such as pear, apple, peach, plum, and cherry. These insects also attack various shade and forest trees. The leaf rollers are destructive to fruit trees during some seasons because of their work on blossoms, young fruits, and foliage. The oblique-banded leaf roller attacks young pears as soon as they set and continues feeding on them until the fruit attains nearly an inch in diameter. They eat large round holes, sometimes extending to or even beyond the core. The larva of

the fruit-tree leaf roller appears as the buds are bursting and feeds on the unfolding leaves. The leaves and blossom clusters are tied together in a web, within which the larvae feed. The injury to the fruit is similar to that described for the above associated species. The caterpillars mature in June, and the moths appear about one month later. The fruit-tree leaf roller deposits its eggs on the bark of the trunk and twigs, where they remain through the winter.

Treatment. Very careful and thorough spraying with arsenate of lead (three pounds to fifty gallons of mixture) should afford satisfactory protection. The first application should be made shortly after the eggs begin to hatch, which will be when the first green foliage is showing on the trees, and the second as soon as the blossom buds have separated in the clusters. The fruit-tree leaf roller has proved a difficult insect to control. Arsenate of lead should be applied as recommended for the associated species. Recent experiments indicate that the insect may be efficiently combated by thorough spraying just before buds open with miscible oil diluted with fifteen parts of water.

The Green Fruit Worms

The green fruit worms, *Xylina* spp., sometimes do serious injury by eating into the young pears. They also attack apples, plums, cherries, peaches, and quinces. The full-grown caterpillars measure from an inch to nearly an inch and a half in length. They are green or yellowish green in color with various irregular markings and stripes, the most prominent of the latter being a narrow, cream-colored stripe down the middle of the back and a wider one along each side. The caterpillars are most destructive during May, soon after the fruit has formed. They continue feeding until about the middle of June. They feed mostly at night, resting on the undersides of the leaves during the day. When full-grown, they go into the ground, form a rough cocoon, and pupate. The adults are dull-colored moths, measuring about two inches from tip to tip with the wings spread. They lay their eggs in spring, and the caterpillars appear during the early leafing period.

Treatment. These insects are difficult pests to combat when



FIG. 313.—THE GREEN FRUIT WORM: (1) CATERPILLARS EATING YOUNG PEAR; (2) MATURE PEAR SHOWING EFFECTS OF INJURY

once they have acquired a taste for the young fruits. They are, however, much less destructive in orchards that are well sprayed each year and given careful attention in other respects. Observations indicate that the most satisfactory means of protecting the crop is thorough spraying with arsenicals before blossoming and after petals drop. Cultivation is unquestionably fatal to many of the pupae in the ground.

INSECTS THAT ATTACK THE FOLIAGE

The Pear Psylla

Probably the most troublesome insect attacking the pear is the pear psylla, *Psylla pyricola* Förster. These tiny insects are similar in many ways to aphides and are sometimes called jumping plant lice. Like plant lice, they are sucking insects, and multiply rapidly, so that unless checked, they make up in numbers what they lack in size and may injure the trees very severely. A number of broods are produced in summer, and the adults that live through

the winter are quite distinct from the summer adults. They appear early in spring and deposit their eggs in protected places on the bark. The eggs hatch in about three weeks, and the little larvae, or nymphs, at once begin to suck the juices from the young leaves and twigs. A favorite place for the young nymphs is in the axils of the leaves and at the bases of the fruit stems. Within two or three days after hatching they cover themselves with honeydew, which finally becomes very abundant. The leaves become stunted and sometimes fall, and the fruit ceases to grow in size and may drop prematurely if the work of this first brood is continued by the later broods. In long-continued attacks the trees may become almost defoliated, and the new leaves, if they appear, are generally few in number and pale in color. With the injury caused by the draft on the sap of the tree, there is joined an external disfigurement of both leaves and wood due to the copious secretion of honeydew by the psylla, which serves as food for the sooty fungus. Growth of this fungus soon gives the wood a smutty, discolored appearance and darkens and stains the leaves. If the attacks of psylla are severe, the trees go into winter in a weakened state and succumb much more readily to low temperatures than do uninjured trees. Renewed attacks, year after year, so lessen the vitality of the trees that they become unproductive.



3
FIG. 314.—THE
PEAR PSYLLA:
ADULT

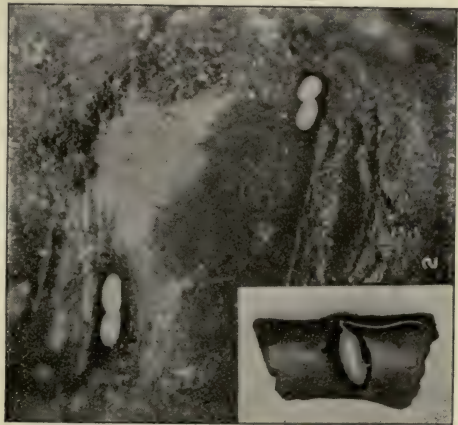


FIG. 315.—THE PEAR PSYLLA: EGGS

Treatment During seasons when it is superabundant the psylla is greatly feared, and most growers fail to protect their orchards.

The causes for failures are not always apparent, but spraying practices with many orchardists are usually faulty in that there is no systematic treatment of the trees, and directions for spraying are not always correctly interpreted or carefully followed. For orchards annually subject to attack the following measures are recommended:



FIG. 316.—THE PEAR
PSYLLA: LARVA
(enlarged)

1. Practice clean culture so as to prevent flies from wintering in accumulations of matted leaves and weeds.

2. Remove rough bark in order to discourage flies from wintering on the trees and to render them more exposed to spraying mixtures. Bark is more easily detached immediately following a wet period. Care should be taken not

to cut into the live tissues.

3. Spray thoroughly to kill the flies with nicotine solution (40 per cent) using three-fourths pint to one hundred gallons of water and three pounds of soap, preferably during a warm spell in November or December, or during March or early April. Select a day when the mixture will not freeze on the trees. Some growers prefer a miscible oil, using one gallon diluted with fifteen gallons of water. This treatment should only be made in spring before the buds open and on days when there is no danger of freezing of the spraying mixture.

4. Spray trees thoroughly with the lime-sulphur mixture at winter strength so as to destroy the eggs. This treatment should be made during the latter part of April or early in May, or just before the cluster buds separate at the ends.

5. Spray the trees thoroughly just after blossoms drop in order to kill the newly-hatched nymphs, with nicotine solution (40 per cent), using three-fourths of a pint to one hundred gallons of water and three pounds of soap or kerosene emulsion diluted with eight parts of water. Direct the spray into the axils of the leaves and fruits, and wet both surfaces of the leaves.

If the work is well done, it is not necessary to carry out all of these measures each year. If the trees have been carefully scraped,

a combination of treatments 3 and 4, or 3 and 5 should be sufficient. Some growers have entirely controlled the psylla with treatment 3 alone, to kill the hibernating flies. Where adjacent orchards are neglected, however, it may be necessary to make applications during the summer so as to control invaders from such unsprayed plantations. In this event frequent and thorough spraying with nicotine solution and soap is advised.

The Pear Slug

The larvae of this species, *Eriocampoides limacina* Retz., are small, shiny, dark green or almost black, sluglike creatures that feed on the upper surface of the leaves, leaving the skeleton of veins and the lower epidermis that turn brown and wither. There are two broods during the year. This insect appears in destructive numbers only in occasional years.

Treatment. Apply arsenate of lead, two pounds to fifty gallons of water, as soon as the pests are detected. Dusting of foliage with freshly slaked lime also affords efficient protection from the insect.



FIG. 317.—THE PEAR SLUG:
LARVA AND WORK ON LEAF
(After Webster) -

The Blister Mite

The blister mite, *Eriophyes pyri* (Pgst.) Nal., is responsible for dark brown or blackish patches, or blisters, of various sizes



FIG. 318.—THE BLISTER MITE: ADULT (enlarged)

that may cover much of the leaf and sometimes cause it to rupture in one or more parts, especially along the margins. The mites burrow into the leaves from below, and the irritation they cause

induces the growth of galls. These at first are greenish pimples with a more or less reddish tinge. The color strengthens as the galls enlarge, appearing as dead areas of varying size. The galls also show one or more tiny openings—the tunnels or burrows made by the mites on entering and leaving the leaf. The mites spend the winter in the buds, usually under the second and third layers of bud scales. They frequently collect in colonies of fifty or more in little depressions in the scales and are more or less concealed and protected by the pubescence of the buds. As the buds burst, the mites move to the unfolding leaves in which they burrow and establish new colonies. In October, the mites abandon the leaves and hide in the buds.



FIG. 319.—WORK OF THE BLISTER MITE ON PEAR LEAVES

Treatment. The mite is easily controlled by spraying the trees in spring before the leaves appear with lime-sulphur mixture. The concentrated lime-sulphur solution should be diluted in the proportion of one gallon of the solution, testing 32 to 34 degrees Baumé, to ten or twelve gallons of water for the treatment of the mite alone; but if scale is present on the trees, the spray should be stronger, one gallon to eight or nine gallons of water.

DISEASES OF PEARS

PROFESSOR M. F. BARRUS

Department of Plant Pathology, Cornell University, Ithaca, N. Y.

FIRE BLIGHT



Fire blight is, without doubt, one of the most destructive diseases of pears in this country. The losses from the disease amounts to millions of dollars every year. Not only are large blocks of nursery pears often absolutely destroyed, but young trees may become affected at any stage of their growth and even old trees are seriously injured if not killed outright.

The disease attacks pears, apples, quinces, hawthornes, and other cultivated and wild species of the apple family, and is reported to occur on plums, cherries, and a few other plants. It is most destructive to pears and quinces although apples may suffer severely from blossom and twig blight. Some varieties of apples show injury to the limbs and the body, especially when they are young. None of the cultivated varieties of pears seem to be immune, although some are injured more severely from the disease than are others.

Symptoms of the Disease

During the dormant season one can detect the disease by the presence of dry brown leaves clinging to the infected branches, while the healthy branches are bare. At this time a distinct crack in the bark often separates the diseased area from the healthy. The disease may also appear on the trunk or limbs as cankers that are sunken areas of varying size separated from the healthy parts by this definite crack. On cutting into the canker one will usually find that the bark is dry and brown and that the dead area extends to the wood below. Oftentimes there will be sprouts or spurs that spring from the tree within the cankered area. These are always

dead and when present give one a clue to the starting point of the cankers. In the case of some trees, especially Kieffers, certain body cankers may affect only the outer bark, injuring the tree but little or not at all.

Dead sunken areas greatly resembling fire-blight cankers may be due to winter injury, but it is impossible to tell in some cases what causes the trouble. Winter injury does not necessarily occur about the base of a spur. It may occur along the west or southwest side of trunk and branches and even encircle them, or it may occur in the crotch and at the base of the trunk near the ground.



FIG. 320.— FIRE-BLIGHT CANKERS ON LIMB OF TREE. NOTE CRACK AT MARGIN OF CANKER

During the growing season one can always distinguish blight by the presence of dead twigs, limbs, or blossom spurs, their dead brown leaves contrasting sharply with the glossy green of other leaves. At this season the margin between healthy and diseased bark on the limbs is not so evident. The affected bark is of a darker color than is normal and when cut into shows a reddish brown discoloration, but there is no crack between healthy and diseased tissues. Sometimes the reddish streaks of diseased tissue may be found to extend for several inches, or more than a foot, underneath healthy tissue of the bark, and so they cannot be discovered without having the bark above removed. The infected tissue may extend

into the roots, either showing on the exterior as a sunken discolored streak, or lying concealed underneath unless the outer bark is peeled away.

The infected blossoms turn dark, become withered, and the leaves of the blossom spur become dead and brown (Fig. 322). The fruit may become infected at any stage in its growth. The affected area has a water-soaked appearance, becomes soft and brown, and later shrinks to a dark-colored mummy. During the

earlier stages of decay a sticky gray substance oozes from the lenticels, collecting in drops that later run down the side of the fruit. This substance may be found in moist, warm weather to be oozing from the affected portion of the tree (Fig. 323). Later it dries down to a firm amber-colored mass that may become almost black.

Cause of the Disease

This disease is caused by one of the lower plant organisms called bacteria. The botanical name of the organism causing fire blight is *Bacillus amylovorus*. Like other bacteria, it is exceedingly small and, while a large number together can be seen with the naked eye, a single specimen is visible only with the aid of a high-power lens. Even then it is seen indistinctly unless one is accustomed to looking through a microscope. These bacilli have an oblong body with from two to four long, whiplike flagella that enable them to swim about in the sap of affected tissues. They increase in number by dividing at the middle into two, and then growing to normal size. This division may take place every half hour as long as conditions are favorable for their development.



FIG. 321.—TWIG BLIGHT. NOTE THAT IT BEGAN AT THE VERY TIP



FIG. 322.—BLOSSOM BLIGHT. NOTE CANKER ABOUT BASE OF SPUR

Life History of Fire Blight

In a more or less inactive condition, these bacteria pass the winter in hold-

over cankers on body or limb or even in infected twigs. They may die out in many such places, and in cankers they are alive only at the margins and often there only in isolated pockets. During warm days in spring the bacteria, nourished by abundant sap, becomes active and begin to invade the adjoining healthy tissues. They increase rapidly in number, and during warm rainy weather may ooze out with the sap through cracks in tissues or through broken down lenticels in viscid milky drops (Fig. 323). This sweet sticky ooze is attractive to insects and is visited, among others, by wasps, bees, and flies. They become smeared with it, and later, in visiting blossoms, leave behind in the



FIG. 323.—CANKERED LIMB SHOWING
EXUDING MILKY DROPS

nectar some of the bacteria that cling to them. Then every blossom visited by these insects becomes inoculated in the same manner. The bacteria increase rapidly in the sweet nectar; other bees visiting it become contaminated and carry the organism to all other blossoms visited by them. In this way the organism may become widely distributed from a single source of infection. One can readily imagine how extensive this distribution would be with numerous sources of infection and with many insects flying.

The bacteria left in the blossoms of susceptible plants

easily penetrate the tender tissues of the flower, where they move about among the cells and absorb the nutritive sap that is needed for the development of the young fruit. The blossoms die after nine or ten days, and the disease shows as blossom blight so commonly observed on apple and pear trees. The bacteria may progress down the spur to the limb where they spread in the tissue about the base of the spur. This infection later shows as a canker (Fig.

322). When the tree is in a succulent and tender condition, the bacteria are able to make their way to the large limbs and even to the body, until it may become very badly blighted or even killed.

Cankers on the body of the tree commonly occur about blighted water sprouts that have become infected from contaminated sucking insects, such as aphids and tarnished plant bugs. Blight cankers may also appear about the borings made by contaminated fruit-tree bark beetles. The germs are sometimes introduced into trees by means of infected buds or scions, or by contaminated grafting or pruning tools; cases have been observed in which cultural tools have been responsible for the spread of the disease in an orchard by chipping the bark of the trees.

Conditions Under Which Infection Takes Place

In order to become infected the tree must be in a susceptible condition, that is, the germ must be able to live and grow in the tissues. This it is able to do if the tissues are tender and succulent. Whenever they are tough and woody, the bacteria in them become rather inactive or die out entirely, and new infections do not often take place. A tree that has but a short period of growth during the season, either because of its nature, or because of unfavorable weather, or cultural or soil conditions, can be subject to infection only during that short period. On the other hand, a tree that for any reason has a long period of growth may become infected at any time during that period, provided the other conditions necessary for infection are present. All varieties of pears are susceptible to fire blight at some period during the season, but some remain in this condition longer than do others and, as a result, have obtained a reputation for being more susceptible. Trees growing under good conditions of culture and fertility remain in a susceptible condition longer than do those in sod or those less heavily fertilized. When weather conditions prevail that tend to keep trees growing, blight will be more common, other things being equal, than during weather that tends to check the growth. The weather, culture, and fertilization that tend to produce a good growth and large fruit render the trees susceptible to blight over a longer period of time than treatment that tends to give a poor growth and small fruit.

Even on trees in the most susceptible condition, however, no blight would occur unless there were present a source of infection in the form of infected tissues. Such infected tissues need not necessarily be in the same orchard and, indeed, may be a considerable distance away, but the nearer and more abundant they are, the more chance there is that new infections will take place. When the trees are in a susceptible condition, there is greater danger of new infections occurring, if the hold-over cankers are oozing, than at any other time. The oozing must take place at the time the trees are in bloom if blossom blight is to occur. As stated earlier, the oozing occurs during, or shortly following, warm moist weather. After the ooze becomes dry so as not to be sticky, it is not so likely to become a source of infection.

Again, the trees may be in a susceptible condition and the sources of infection may be abundant, yet no blight occurs unless there is an agent to transport the germ and introduce it into the susceptible plant. These agents, however, are usually abundant both in the form of insects and of man with pruning tools.

Methods of Control

With these thoughts in mind we shall proceed to an outline of control measures. The first step to be taken in controlling fire blight is the removal (during the dormant season) of sources of infection so far as possible. Not only should all infected branches, twigs, water sprouts, and hold-over cankers be removed, but badly infected trees should be cut down. Old hawthorne and wild crab-apple trees along fence rows and in pastures frequently harbor blight, and should therefore be destroyed. All affected portions cut away should be burned, although it is not necessary at this season to be particular about small twigs that can be plowed under.

In removing blighted twigs and limbs, the cut should be made several inches below the line separating diseased and healthy bark. In removing cankers on body or limbs, the operator should make a clean spindle-shaped cut with a heavy sharp knife about two or three inches from the margin of canker at the sides, and four or five inches away at top and bottom. Care should be taken

not to leave any unopened gashes, as infection may occur there. All bark within the cut area must be removed so as to expose the wood, but it is not necessary to cut away any of the wood. If in removing the bark it is found that discolored bark remains, this also should be cut away and the cut surface should be swabbed out with a sponge or cloth saturated with a solution of corrosive sublimate, made by dissolving one corrosive sublimate tablet in a pint of soft water. This solution must not be kept in metal containers. It will be found convenient to carry an ordinary pint or quart bottle of the liquid, to which a sponge is attached by means of a long cord. Care should be taken to see that every part of the wound is wet with this disinfectant. Germs can be carried on the tools, but if the wound is disinfected every time a cut is made no infection will result. After the wound has dried out, a protective covering of coal tar will prevent decay of the heartwood. This covering can be applied later in the dormant season if desired.

Since the bark of a young pear tree is smooth, cankers may be readily detected. As the tree grows older, the outer bark cracks and splits to accommodate the bark within. Oftentimes these cracked areas greatly resemble fire-blight cankers. If in cutting into such areas one finds healthy green bark, it is an indication that no canker exists. One should be careful always to disinfect all cuts or other wounds made in healthy bark. Fire-blight bacteria are known to produce superficial cankers, referred to earlier in this bulletin, in which only the outer bark becomes affected. As they do no special harm, these should not be removed. No matter how much like a canker a certain area on the surface may appear, it should not be cut away if there is green or white tissue beneath. If, however, it is discolored red, brown, or black, whether due to fire blight, winter injury, or other causes, it should be removed and treated as described above. Fruit spurs coming from the body and large limbs should be broken off, as they are a frequent source of canker.

The removal of sources of infection in and about one's orchard is a big step toward the control of fire blight, but as long as such sources exist in the neighborhood one cannot hope that infections will not occur. In order to reduce the danger of fire blight to a minimum, an entire community should take action against it.

If one has been careful to remove such sources of infection from his own orchard, however, he may hope to be able practically to prevent serious injury to his trees by frequent patrol.

The patrol should be carried on regularly and systematically during the susceptible, or growing, period of the trees. This means going over the orchard two or three times a week, and walking up and down each row in order to look for blighted twigs or blossoms. When these are found they should be cut away and the wound disinfected or, if small, they may be broken away with the hand, in which case disinfection is not needed as no tool has come in contact with the wound. The twig should be removed at a considerable distance below the part visibly infected, and for perfect safety it is advisable to remove it at the limb. A twig or a spur thus removed soon after infection is observed will save the limb or even the entire tree. Soon after blossoming time special care should again be given to patrol. The blighted blossom spurs may also be broken off with the hand. If these infected twigs dry up soon after being removed, the bacteria on them die and they are therefore not dangerous, but if moist weather prevails at this time, the bacteria remain alive and the twigs may prove to be a source of infection. It is safer, then, to collect and burn the removed twigs.

If new infections seem to occur more abundantly and frequently in a particular section of the orchard, it is a good indication that hold-over cankers have been overlooked. A careful outlook should be kept up for them in order that they may be removed before much oozing occurs.

One farmer who is successful in the control of this disease patrols his orchard with the help of two bright children sitting beside him on a democrat. The children receive a nickel for every infected twig they discover, and one may be sure that none escapes them, yet the father says the work is cheap at that.

If it were possible to destroy the insects that carry blight, the problem of control would be very simple. Some are difficult to destroy, while others, especially honey bees, we do not wish to injure. In answer to the question whether honey bees should be kept in an orchard, we would say that they are unquestionably very active agents in disseminating the blight bacteria during blossoming time, and that if sources of infection are near and are

oozing, the presence of colonies of bees in an orchard will result in a general infestation. They will not carry the bacteria, however, unless the latter are oozing from infested areas, and the bees cannot inoculate any part of the tree except the blossom. We believe that these insects do far too much good in cross-pollinating flowers to exclude them if we could, and that our efforts at control would better be directed toward cleaning up sources of infection. Control measures directed toward sucking and biting insects are helpful in reducing the number of new infections.

As the bacteria are ordinarily unable to enter uninjured tissue, spraying the trees with a fungicide is not effective. None of the numerous blight remedies on the market that we have tried have proved effective in controlling this disease, and some of them have injured the tree. Growers should not buy such remedies except for experimental purposes.

When blight infections become general in an orchard, efforts at control by removal of infected areas may be unavailing. An attempt should then be made to stop growth and harden the wood by ceasing cultivation and even by seeding to a cover crop; in fact, unless one is prepared to fight blight, intensive cultivation and fertilization may prove to be impracticable.

Certain varieties, especially Kieffers and Seckel, usually have a shorter susceptible period than do most other trees and are therefore less likely to become blighted. Cases are known, however, in which orchards of large Kieffer trees have become badly blighted and in the nursery these varieties blight as badly as any. Grafting susceptible varieties on such stock with the idea of avoiding blight has not given general satisfaction.

The method of control outlined will not prove successful unless the measures recommended are regularly and systematically carried out. The person engaged in it should study the disease in order to be able to recognize all its stages and all the forms in which it may appear, not permitting other work to interfere at any time. For this reason, the general farmer is not prepared to fight fire blight, and in fact there are comparatively few growers prepared to do it. Those who wish to practice good cultural methods and to keep the disease under control would do wisely to employ a person capable of carrying on the work for them.

By devoting all his time to the work such a man will be able to handle about forty to fifty acres of ten-year-old trees; older trees will require more time than do younger ones. A group of growers having a small area may combine to employ such a man during the growing season. An area considerably larger could be handled by a man of ability if sufficient assistance were placed at his command.

PEAR SCAB



FIG. 324.—SCAB ON FRUIT OF PEAR. NOTE CRACKS DUE TO SCAB

This disease greatly resembles the scab of apple, and the causal organisms of each are closely related. The disease is widely distributed and probably occurs wherever pears are grown commercially. In the United States, it is reported most commonly from the northern section, but its attacks have been severe even in California. It occurs most abundantly during moist cool weather, and sections where such weather prevails are most likely to be troubled.

The Flemish Beauty is especially susceptible to the disease both in nursery and in orchard, although scab is said to occur on such varieties as Summer Doyenne, Duchess, Clairgeau, Sheldon, Seckel, Anjou, and Lawrence, while LeConte, Kieffer, and Bartlett are less likely to be affected.

Symptoms and Cause of Scab

The disease attacks leaves, twigs, and fruit. The spot on the leaves is characterized by dark olivaceous strands radiating from a center over the leaf surface. The spots may occur on either surface, and while not large they may be so numerous that the entire leaf is covered with them. Badly affected leaves are usually much puckered or curled. On the fruit the spots are similar although the growth is denser (Fig. 324). If the scab becomes extensive on the fruit during its growth, severe cracking results.

This cracking is commonly associated with the presence of the disease on the Flemish Beauty. On the twigs, the disease appears as blisters, which later break open, giving the twig a rough scabby appearance.

The disease is caused by the fungus *Venturia pyrina*, which produces its summer spores in abundance in the scab spots. These spores are commonly disseminated by wind, and during cool moist weather will germinate and infect the tender leaves, fruit, or twigs. Such infections result in new spots that in turn produce more spores.

While it is known that the fungus may pass the winter in lesions on infected twigs where summer spores are produced the following spring, it has been shown that it also passes the winter in the fallen leaves that were scabby when alive. On these leaves minute fruit bodies are produced from which during April or May sexual spores are discharged, and these caught by air currents are carried to the opening buds. Early infection takes place from these during favorable weather.

Methods of Control

The disease on pears may be more difficult to control than apple scab because the fungus is able to pass the winter in infected twigs. However, thorough applications of either bordeaux mixture, 4-4-50, or lime-sulphur solution, 1-50, made at the proper time will give good results, especially if made year after year. Foliage injury has sometimes resulted from an application of lime-sulphur so that bordeaux mixture may be preferable. The first application should be made when the petals show pink but before the blossoms open; the second, soon after petals fall; and a third, about two weeks later. As in the case of apple scab, other applications may be necessary if wet weather prevails.

LEAF SPOT

In the United States leaf spots occur commonly wherever pears are grown, in both nursery and orchard. While Kieffer and a few others show resistance, most varieties are susceptible in varying degrees. The disease occurs only on the leaves, but the tree may be reduced in vigor from an early defoliation brought about by an

attack. The spots on the leaves vary in size from a pinhead to a pea. They are round, oblong, or irregular areas with curved or angular margins. The center is somewhat transparent and gray in color, this color being especially noticeable on the upper surface. Within the affected area one



FIG. 325.—LEAF SPOT ON PEAR

can plainly discern, especially in old leaves, several minute black specks, the fruit bodies of the causal fungus (Fig. 325).

The disease is caused by the fungus *Mycosphaerella sentina*, which produces numerous needle-shaped spores in minute fruit bodies, mentioned as occurring in the spots on the leaves. The spores adhering to each other are forced out of the fruit bodies in long, dark-colored, ropelike strands and are disseminated to other leaves by wind or by spattering raindrops. In the presence of moisture the spores germinate and infect the leaf.

The fungus winters on the fallen leaves and produces there the winter fruit bodies from which sexual spores are discharged during the following spring. These are responsible for bringing about the first infection of the year.

The disease can be largely prevented by the applications given for the control of pear scab.

LEAF BLIGHT

This disease is general in the Appalachian region and occurs commonly in practically all nursery districts. In New York it is said to be more abundant in the orchards of the Hudson Valley. It may become severe on pears and quinces and is reported to attack hawthorne, apple, and a few other related plants. Most varieties of pears are susceptible, although Duchess and Kieffer are reported to be resistant, and, of varieties in the nursery, the Kieffer, Angouleme, and Flemish Beauty are said to be freest from attack.

The disease causes a spotting of the leaves, twigs, and fruit. The spots on the leaves are small and on the upper surface show as reddish circular areas surrounded by a dark border. Later the spots become dark-colored, and a minute elevation may be seen at the center. When the attack is severe, the leaves become yellow or brown and readily fall off. The spots on the leaves can be distinguished from leaf spot because they are smaller, more circular in outline, and more brightly colored, especially when young, and also by the absence of the numerous minute black bodies. The spots on the fruit are red at first but become dark-colored later. The fruit may become cracked as a result of the attack much as when badly affected by scab. The appearance of the disease on the twigs is similar to that on the leaves. The spot may enlarge so

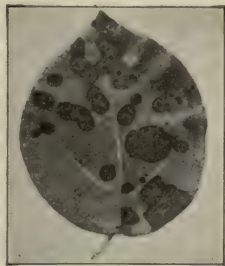


FIG. 326.—LEAF
BLIGHT ON
QUINCE



FIG. 327.—LEAF
BLIGHT ON
FRUIT OF PEAR

as to encircle the twig, thereby causing it to die. Quince stock and pear seedlings are said to be especially susceptible.

The disease is caused by the fungus *Fabrea maculata*, which produces its summer spores in the center of the spots above described. These are disseminated in the moist weather of summer. The fungus may winter over in the infected twigs, but infection in spring is commonly brought about by sexual spores produced on the fallen leaves in which the fungus has wintered.

Either bordeaux mixture of standard strength or lime-sulphur solution 1-50 applied as for pear scab, will control the disease should it appear in the orchard.

PACKING AND MARKETING PEARS

ARTHUR FARRAND, "THE PINES," HUDSON, N. Y.

Today we have a state law regulating the grading and packing of apples, which requires that the name and address of the packer, and the grade of the fruit, be plainly branded on each barrel. This law does not apply to pears; consequently each grower has his own way of packing and grading, which places the buyer at a disadvantage unless he is familiar with the methods of the grower. I believe we should have a law governing the grading and branding of pears as well as of apples.

IMPORTANCE OF PROPER PACKING

During the past season some fruit growers tried packing their best pears in bushel baskets, but this plan did not prove satisfactory, since much of the fruit did not stand up well in transit and arrived at its destination in a badly bruised condition. Notwithstanding this fact the fruit sold for more, in comparison, than if it had been in barrels. I have always contended that our better grade of pears should be boxed, and should be put up in an attractive manner. Although this will require more care and expense, I firmly believe the grower would be well paid for the extra trouble.

New York State has made great strides in the last few years in producing pears of extra fine quality. The flavor of New York State pears is now better known, and there is a greater demand for them than for the California fruit. The latter has had the preference on account of good color and attractive packing. However, it is inferior in flavor, being necessarily picked green for shipment three thousand miles.

We have been packing in standard barrels, according to three grades: Fancy, No. 1, and No. 2. Our fancy grade consists of the largest pears of uniform size and at least 90 per cent free from worm holes, scale, or other defects. In our No. 1 grade are the pears next in size, but not below two and one-half inches in



FIG. 328.— WELL-GROWN PEARS READY TO BE PICKED FOR MARKET AT "THE PINES,"
FARM OF ARTHUR FARRAND, HUDSON, N. Y.

diameter; there are also at least 90 per cent free from worm holes, scale or other defects. The No. 2 grade would properly be called seconds. They are not so uniform in size, and are only 80 per cent free from defects. In this grade we put pears under two and one-half inches in diameter. We plate all barrels with two layers, and use corrugated caps top and bottom, except on the No. 2 grade.

ESTABLISHING A MARKET

Our fruit is sold mostly through commission houses in New York City, but occasionally we have sold to speculators. It has been our custom for several years to place the name of our farm, and the owner's name and address, on all barrels of our better grade of fruit, and I believe this has had much to do with obtaining good prices, because by this method our pack and brand is better known.

An instance occurred a few years ago that thoroughly convinced us of the importance of a uniform and honest pack, and of a trade mark. Our shipments were all made by boat, arriving in New York the next morning. When making the first shipment of Bartletts we wrote our commission house, as is our custom with each shipment, and requested a telegram advising us as to the price for which the pearse sold (each day's sales are immediately reported by wire and in this way we keep in close touch with market conditions, which is very important). Report of sale of our second shipment was received by nine o'clock in the morning. This early report puzzled us, because in the rush season the boat is very often late in reaching New York, and it is sometime noon before shipments are delivered to the consignee. Several weeks later, while the writer was in New York, this promptness in reporting sales was explained. It seems our first shipment of Bartletts was sold to a large dealer in Harlem, and, as soon as a careful examination had been made, he immediately telephoned our commission house that he would take all Bartletts received, marked "The Pines." So, when our commission house received word of the quantity we had shipped the night before, they at once reported sale by telegram.

I think this should convince the fruit grower that if he expects satisfactory prices he must be honest with his packing and grading; also, that the establishment of a trade mark is not only a good advertisement, but will aid in marketing his fruit quickly and satisfactorily.

SELLING THROUGH COMMISSION HOUSES

Many fruit growers make the mistake, and we have in the past, of consigning shipments to half a dozen different commission houses. This simply means that the grower is competing with himself, and the results will not prove satisfactory.

Another important matter that should not be overlooked is the fact that many commission houses have become extensive speculators. This means that the chances of securing good prices by selling through these speculating houses, which are owners of large quantities of fruit, are few, unless a price limit has been placed on our shipments. When prices are high they are very likely to unload their own fruit, and, when prices are low, it is quite probable that it will be our fruit that will be sold.

CONCLUSIONS

The fruit grower should first endeavor to produce first-class fruit. Then, if he handles it carefully and packs it honestly, he will readily find a profitable market, as in the instance above cited. Doubtless the New York State Department of Foods and Markets, in New York City, will aid in solving the marketing problem, and will prove a help to the grower.

It is well to remember that in order to obtain top prices our fruit must look attractive, and must be uniform in size. The more attractive the package, the greater the advantage. Appearances go a long way toward making a good sale. The grower should put the name and address of his farm on all choice fruit, whether in barrels, boxes, or baskets. Then it will not be long before there is a call for his brand.

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF PEARS
IN NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Trees</i>	<i>BusheIs</i>
Albany	43,404	30,275
Allegany	10,649	6,571
Broome	9,262	6,498
Cattaraugus	10,059	4,364
Cayuga	36,687	23,088
Chautauqua	22,110	13,633
Chemung	5,458	4,589
Chenango	7,474	6,650
Clinton	3,548	1,880
Columbia	170,777	121,691
Cortland	7,918	4,994
Delaware	8,024	6,971
Dutchess	34,870	23,805
Erie	70,056	31,327
Essex	1,527	1,365
Franklin	291	66
Fulton	1,188	920
Genesee	85,035	36,608
Greene	122,882	75,902
Hamilton		
Herkimer	4,047	4,479
Jefferson	2,896	1,643
Kings	12	5
Lewis	256	186
Livingston	8,634	4,562
Madison	6,563	6,031
Monroe	192,134	117,044
Montgomery	5,159	2,742
Nassau	3,491	4,746
New York	19	30
Niagara	381,710	216,227
Oneida	9,860	7,665
Onondaga	13,900	11,959
Ontario	74,451	45,927
Orange	33,098	21,994
Orleans	196,513	105,233
Oswego	101,412	58,163
Otsego	10,358	8,965
Putnam	3,149	1,955
Queens	403	372
Rensselaer	28,049	28,727
Richmond	478	213
Rockland	11,166	8,661
St. Lawrence	428	330
Saratoga	15,718	10,427
Schenectady	4,719	3,613
Schoharie	8,671	6,488
Schuyler	5,888	4,359
Seneca	29,468	23,066
Steuben	17,555	12,269
Suffolk	15,038	6,779
Sullivan	6,762	4,227
Tioga	6,596	4,942
Tompkins	16,609	12,613
Ulster	95,392	68,307

<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Warren	795	473
Washington	9,382	7,662
Wayne	102,279	78,034
Westchester	9,350	10,620
Wyoming	25,420	12,519
Yates	32,549	17,635
The State	<u>2,141,596</u>	<u>1,343,089</u>

THE PEACH

"The ripest peach is highest on the tree."

JAMES WHITCOMB RILEY

[1059]



NIAGARA

PEACHES IN EASTERN NEW YORK

PERCY L. HUESTED

Fruit Grower and Nurseryman, Blauvelt, Rockland County, N. Y.

In Eastern New York today more peaches are grown than were grown twenty-five years ago, but not better peaches. The fine-flavored peaches of the Persian type have practically been dropped from the planters' lists, and Wheatland, Globe, Melacatoon, Crawfords, and Reeves Favorite are set no more except in home gardens. Delicate peaches of the Early Rivers and Horton



FIG. 329.—YOUNG PEACHES THRIVING ON SOIL OF SLATE ROCK, ORCHARD OF PERCY L. HUESTED, BLAUVELT, N. Y.

Rivers type are also gone. The old varieties are not dropped because of their quality, however, but because growers found that far larger yields per acre were more profitable, and other varieties were more frost-proof, and because all fruit dealers insist that a quality of the Elberta level is high enough. What the fruit trade likes is a peach of good appearance, fair size, and good keeping quality.

Elberta has the lead in the plantings because of its good yields, large size, and regular cropping habit. No peach makes more

money for the growers, and none pleases the fruit trade better. It marks the high tide of the peach supply and in its season has no real competitor. At long intervals the consumers mention Morris White, Crawford, Old Mixon, Heath Cling, or some other old favorite, but for the present-day grower and dealer alike the ideal varieties would be a series of Elberta types covering the season from beginning to end. On the introduction of Elberta, it was promised that a new race of peaches would supply something like this, but today few peaches match the Elberta with season earlier or later.

DESIRABLE VARIETIES AND THEIR CHARACTERISTICS

The J. H. Hale is a new yellow peach fruiting just with Elberta in 1915. It may displace Elberta or be a competitor for first place in the midseason week. An earlier yellow peach is lacking. The Wilma is another of the new varieties offered as a new Elberta seedling with season a week later.

The growers who do not feel that their entire plantings should be Elberta because of the rush and lower prices consequent during Elberta week, therefore plant a succession of varieties beginning with Greensboro, which ripens in late July and early August. Its size is large, its buds are hardy, and it does not rot so rapidly as some of the extra early kinds do.

Mayflower is still earlier, but suitable for home use only. After Greensboro, the Waddell gives satisfaction as a home garden white peach with most brilliant red skin. The growth is not the most vigorous, and commercial growers have dropped it on that account.

Carman is a hardy peach most precocious in its bearing habit and, while like all the early peaches it is a cling or semi-cling, yet is in good demand, and its appearance has made it as many friends in the market as its free bearing habit has on the farm. Thinning and high feeding are essential with it.

Heiley, or Early Belle, follows as a freestone peach with tender skin and some liability to rot in wet seasons.

Champion is larger, and when ripened on the trees none is better in flavor. It bears heavily throughout a long period, and

if it were entirely a freestone no doubt it would rule the mid-early season. Summer spraying checks its tendency to rot and spot and also adds to its keeping quality. The Champions seldom reach the consumer with the flavor for which they are noted, since usually they are picked too green in order that they may carry.



FIG. 330.—ELBERTAS, UNGRADED. FROM THE ELEVENTH CROP ON TREES SET BY PERCY L. HUESTED, BLAUVELT, N. Y., IN 1902

Belle of Georgia is often mentioned as a white Elberta. Its fault is that it overlaps with Elberta most years, and the last half of its crop must be sacrificed at low prices in consequence. This peach is of the largest size, a freestone, and is hardy in bud.

Following Elberta, Frances has proved a variety of solid merit among yellow peaches. The size averages below Elberta, but its yield seems equal.

Stevens Rareripec is distinctly a Hudson Valley peach. Elsewhere its tendency to rot and spot has made it worthless, although summer spraying will doubtless widen the territory over which it may be grown. It is a large freestone peach with red color

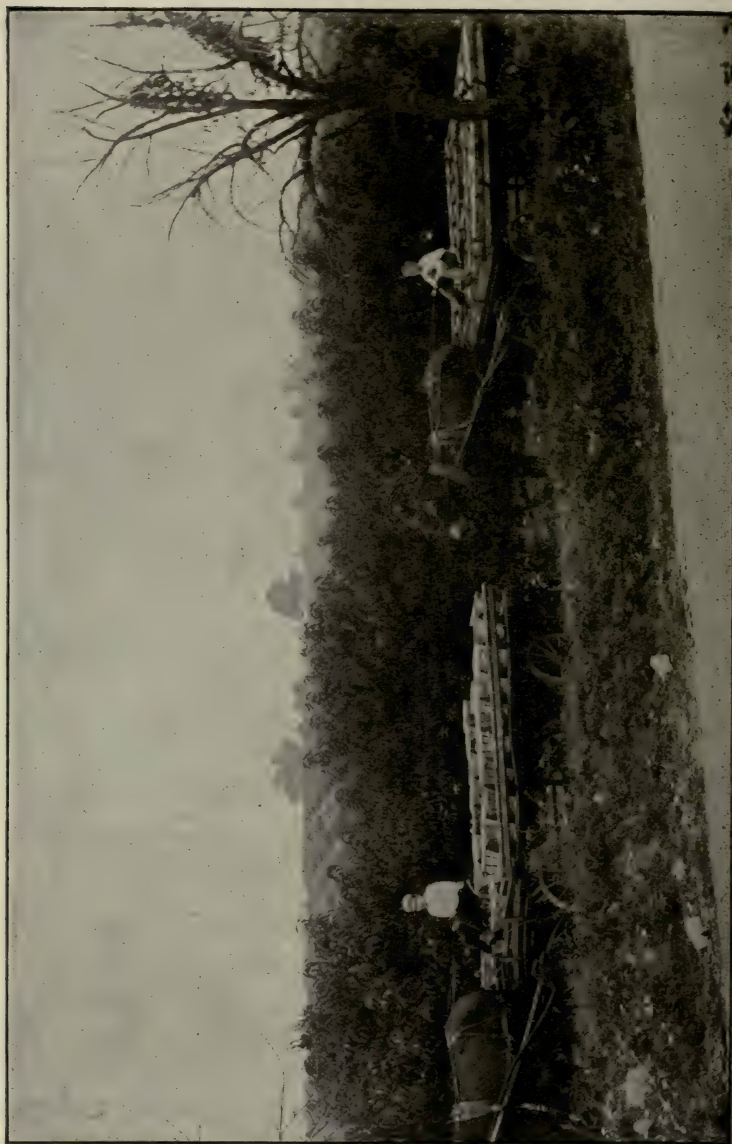


FIG. 331.—SIXTY-BASKET LOADS FROM ORCHARD TO PACKING HOUSE

over white flesh, and as it ripens in cool weather it can be shipped well to any market. In many cases the trees do not bear heavily when young, but its regular bearing habit has made the peach very popular.

Iron Mountain follows Stevens and lacks the good red color of the latter. No peach is of better flavor when canned, and none is a more dependable bearer. It must be thinned to give size, but will then yield white fruit, large to very large.

Willetts is a firm-fleshed, large yellow peach, ripening in early October. It does not bear while young, but seems to be unequaled at its season for home use and commands a favorable place in the markets. Its quality and wood growth are of the Crawford order.

During October the supply of yellow peaches is chiefly of Salway, Smock, and Wonderful, all peaches that are firm and somewhat dry of flesh and not extra high in flavor. They yield a heavy crop per acre, when well fertilized.

Bray's Rareripe is preferred by many as a late peach, but the tendency is to largely cut off the planting of extra late peaches in eastern New York, since consumption falls off heavily after October first.

LOCATION AND CLIMATIC CONDITIONS TO BE CONSIDERED

The foregoing is written from the standpoint of a grower in the most southern part of the Hudson Valley, where peach crops have not failed for the past eleven years. There is much variation in the climate of eastern New York as regards temperature. Further north during this eleven-year period several crops have been lost through the winterkilling of buds by severe midwinter cold, and damage through the light frosts at blossom time has also been frequent. Varieties particularly hardy with respect to midwinter cold are Crosby, Hill's Chili, Carman, Salway, and Stevens.

The spring frosts at blossom time are the most damaging in the southern states, but in New York these late frosts are of lesser importance, and varieties that do not open all their blossoms at once rarely lose a percentage of bloom large enough to affect the crop. All the peaches of the class of Greensboro, Waddell, and Carman

set abundant buds and do not open them all at one period as do the peaches of the Crawford class.

Local elevation saves many peach buds from frost damage of either midwinter or spring type, when peaches on lower sites suffer. Contrary to prevalent opinion, orchards well fed and cultivated suffer less winter injury than do those in which the trees are making scanty growth.

LIABILITY TO DISEASE

Scale, yellows, and little peach are diseases that show no preference for one variety of peach over another so far as the writer's observation goes. Cases in which the loss through yellows is heavier in one variety than in another are frequent, but seem to be traceable either to tainted stock of a particular kind or to the fact that the initial outbreak was in a block of a particular kind and adjoining trees were earlier exposed to infection.



FIG. 332.—SMALL TRUCKS WHICH CAN DELIVER ONLY LOCAL LOADS WITH ECONOMY

With respect to leaf curl and brown rot, varieties differ much in the power of resistance. Elberta is the most subject to leaf curl, and the spraying in early spring or midwinter with lime-sulphur

at scale strength can be omitted only at considerable risk. Brown rot difficulties are much lessened through the use of Scott's unboiled lime-sulphur mixture, and the keeping quality of the fruit is improved. This new practice of summer spraying of the peach seems likely to widen the territory greatly over which good quality stock may be produced, and the hills along the Hudson may in consequence lose their advantage long enjoyed in that favorable elevation where the production of clear fruit without spraying in summer is assured.



FIG. 333.—TRUCK READY TO LEAVE ORCHARD OF H. H. BROWN, MONSEY, N. Y.
LOADS OF SIX TONS ARE NOT UNUSUAL.

The progressive peach grower must be prepared to change varieties oftener than the grower of other tree fruits and be prepared to fight more intense battles with plant diseases than other growers. Few peach men in eastern New York are friendly enough with their trees to make prompt use of the axe, but without it the little understood diseases of yellows and little peach ordinarily shorten the life of the orchard far below the allotted span. Relief attained through the planting of immune varieties, a practice advocated by some, has never proved effective with the worst foes of the peach tree in eastern New York.

MARKET CONDITIONS

The 1915 season showed a market in all great cities filled to overflowing. Ruinous prices ruled throughout the season. Thirty years ago New Jersey lands were being set to peaches to such extent that many areas promised to be simply great peach plantations, but low prices and particularly the spread of scale, yellows, and other troubles wiped out the industry. Yellows and little peach certainly offset new plantings now.

Production costs in the southern end of the Hudson Valley are probably as low as anywhere north of Delaware. The transportation is now almost universally by motor truck and is cheaper and more satisfactory than any rail service. Notwithstanding these advantages only a select few of the varieties can be grown at any considerable profit with prices at the level of the past season. New varieties may and probably will displace most of the kinds described in this account, and particularly would firm, large yellow, freestone kinds find places in the early season.

PEACHES IN WESTERN NEW YORK

E. H. ANDERSON, LOCKPORT, N. Y.

Farm Bureau Manager, Niagara County



The peach section of western New York is confined to the northern part of the counties of Niagara, Orleans, Monroe, and Wayne, extending back from the shore of Lake Ontario only as far as the ameliorating influence of the lake is felt. This gives an area varying in width from six to ten miles and nearly one hundred miles long, in which the bulk of the peaches are grown.

The United States Census of 1910 credits New York State with the production of 1,176,483 bushels of peaches, of which 1,090,378 bushels were produced in the western New York section. Since this Census was taken, many young orchards have come into bearing, greatly increasing the production.



FIG. 334.—LOOKING NORTH FROM THE RIDGE ROAD IN NIAGARA COUNTY
(PEACH ROWS NEARLY ONE MILE LONG)

SOILS AND FERTILIZATION

From surveys covering one hundred and sixty orchards taken in Monroe and Niagara counties, it was found that the majority of the peach orchards are on loamy, sandy, or gravelly soils of the

Dunkirk Series. These soils are adapted to peach growing because of their position bordering Lake Ontario, because of their natural good drainage, and because their warmth produces highly colored and well-flavored fruit. Owing to the rapid growth made by the peach and the type of soils on which it is grown, it is generally found necessary to add fertility to the soil. In most cases an occasional light application of barnyard manure is used. Sometimes this is supplemented with commercial fertilizers.

CULTURAL METHODS

The peach produces its fruit on wood of the previous year's growth. It therefore becomes necessary for considerable new growth to be produced each season, in order to obtain a crop the following year. This growth must be well matured in order that the fruit buds may withstand the cold snap of our winters. It has been found practicable to adopt a system of cultivation that will encourage rapid growth of wood early in the season and check this growth so that it will properly mature before winter sets in.



FIG. 335.—TREES PLANTED 18 FEET APART NEARLY TOUCH AT FIVE YEARS. CLEAN CULTIVATION IS FOLLOWED UNTIL JULY 15, THEN WEEDS ARE ALLOWED TO GROW.

The cultural system that is generally meeting with favor is to plow or cultivate three inches deep as early in spring as possible, ordinarily about the first of May; then to cultivate with a harrow every ten days or after every rain, in order to conserve soil moisture. This cultivation is usually discontinued about July 15. In case of a large crop of fruit or a dry period, cultivation is often continued well into August.

Under the present system of intensive clean cultivation, the humus is rapidly exhausted from the soils, and in order to keep the vigor and fruitfulness of the orchard, it becomes necessary to add barnyard manure. The same results are being obtained with leguminous cover crops wherever they are being consistently used.

PRUNING METHODS

If not pruned, the peach tree naturally grows upright, adding one year's growth above another and forming only a few main limbs that are long and brittle and break easily under a load of fruit. It therefore becomes necessary to adopt a system of pruning that will spread the tree, conserve its vigor, renew its growth, and keep the bearing wood low. This means that in the young orchard the pruning shears must be freely used in order to start a low head with spreading top, which is done by cutting the previous year's growth well back to an outside bud.

The open center peach tree is found to be most practicable. This allows for a better circulation of air and more sunlight, thus producing fruit of good color and reducing its liability to fungous diseases.

The mistake is commonly made of planting peach trees too close together, the distance varying all the way from 16 x 16 feet to 20 x 20 feet, a common distance being 18 x 18 feet. This distance is not sufficient for mature trees; the trees crowd and are forced to grow high. A better distance would be from 20 to 25 feet each way depending on the strength of the ground. With this distance, enough space would be allowed to adopt a system of pruning which would start the head low and spread the top, keeping the bearing wood low so that the fruit could always be harvested with a five-foot stepladder. The writer prefers that these heads be kept so low that even a stepladder is unnecessary in harvesting. Many of the older orchards were started with high



FIG. 336.—ONE TREE FROM ORCHARD SHOWN IN FIG. 335
An ideal type, obtained only by proper pruning when young. From the orchard of E. H. Anderson, at Hilton, N. Y.

heads, and are now so high that it is slow and expensive work to harvest the fruit. The only disadvantage of low-headed trees is that it is not so easy to work with a team among them, but the low extension orchard tools now on the market overcome this objection. The advantage of the low head is its economy of time. It saves time in pruning and spraying, but most important of all, it saves time in harvesting. A picker can harvest from 50 to 100 per cent more fruit in a given length of time when no ladder is needed.



FIG. 337.—VIEW IN A 25-YEAR-OLD PEACH ORCHARD IN NIAGARA COUNTY. ALTHOUGH THRIFTY, THE TREES ARE SO HIGH THAT HARVESTING IS EXPENSIVE

The period during which cultivation can be done extends over several weeks, while harvesting must be accomplished in a few days; sometimes it is a matter of a few hours. The low-headed tree must be accepted in western New York as a matter of economy.*

VARIETIES

The commercial peach of western New York is the Elberta. Considerably over one-half of the planting is of this variety. Next in importance is the Early Crawford. This is a favorite in the older orchards, but because it is not prolific on all soils, it is

* See article on pruning the peach, by Professor M. A. Blake, p. 1084.

being supplanted by other varieties. A survey taken in 1915, covering 83,900 bearing trees in Niagara County showed the principal varieties in order of importance to be: Elberta, Early Crawford, Late Crawford, St. John, Niagara, Reeves, and Chairs Choice.

MARKETING

Although the peach production of western New York is large and the fruit very perishable, the industry is entirely unorganized. There is no uniform type of package or standard for packing. In one section the fruit is sold by the pound, the buyer doing the packing; in another, the grower sells in bushel baskets, while his neighbor packs in Jerseys or "high hats," both selling to a local dealer or consigning to some commission man.



FIG. 338.—AN 8-YEAR-OLD PEACH TREE THAT HAS NOT BEEN HEADED BACK. TWO-THIRDS OF FRUIT MUST BE PICKED FROM A LADDER

The presence of one or more cold storage plants in nearly every producing center makes it possible for the fruit to be pre-cooled instead of rushing it on the market. This has been a great saving to the peach growers of this section. During the present season at many points there has been a serious effort to pack and market peaches through a central packing house. This system commends itself as an important step in the solution of our complicated marketing problem.

THE OUTLOOK

The peach crop, always uncertain and never as profitable as it is reputed, has received several severe setbacks in the past four seasons. The crops of 1912 and 1915 were so large that it was impossible for growers to harvest them at a profit, and thousands of bushels rotted on the ground. During the winter of 1913-1914 the peach fruit buds were so damaged by the cold that the resulting crop in the fall of 1914 was almost nil. Thus only the season of 1913 remains during recent years in which the peach growers could figure much profit. Under such conditions, there is not sufficient profit in the industry to maintain itself.



FIG. 339.—AN 8-YEAR-OLD PEACH TREE, PRUNED TO KEEP THE BEARING WOOD LOW. ALL FRUIT CAN BE PICKED FROM THE GROUND. (COMPARE FIGS. 338 AND 339.)

It is not probable that such a general failure as that of 1914 will happen again in several years, although there is always such a chance. There is, however, every reason to expect the repetition of the crop of 1915. With peaches from the Virginias, Maryland, Ohio, Michigan, Connecticut, Pennsylvania, and New York all coming on the market at the same time, the only hope for the renewal of profitable peach growing under our present system of marketing, lies in the fact that western New York may have a

crop of peaches when the crop fails in one or more of the other competing states. While this is quite possible, it is too uncertain to appeal to the conservative grower.

Our solution seems to be to face the fact of a probable continuation of large production; and to prepare to meet this by organizing for the purpose of more economic packing, for a standard pack, for extending our distribution, and for advertising to increase consumption. Without organization a repetition of the experience of this season must be expected.

CULTURAL METHODS FOR THE PEACH, AND MARKETING

A. T. HENRY, WALLINGFORD, CONN.

CHOICE OF LOCATION

The selection of the orchard site is one of the important points in successful peach growing. If unsuitable, no amount of work can make the orchard profitable. Under no conditions should trees be planted on wet land, and often even hilltops and hillsides are wet. If drains can be laid and other conditions are favorable, such lands can be used, provided they are not too steep for the use of a spraying machine. Air drainage is just as important as water drainage. An orchard located in a hollow is more likely to be frozen in winter; and, if it escapes, the fruit is likely to be affected by fungous diseases.

Large orchards should not be set out unless peach trees are known to bear fairly regular crops in the immediate vicinity; often only five miles means the difference between good crops and no fruit, especially if protection is afforded by a body of water. Hillsides or elevated land is generally best for orchards, although the same protection from frosts is often secured on level land by a body of water. This is well illustrated by the growing of peaches on comparatively low, level land in Michigan and on the southern shores of Lake Ontario. Severe cold in winter is not to be feared so much as late spring frosts after the buds are started.

Excessively rich land is not best for a peach orchard, for on such land the trees will grow instead of bearing. Rather select a poorer soil, and, by means of fertilizers and cover crops, produce a tree that grows moderately and bears well. Some very profitable orchards are located on thin gravelly and stony soils, or on very light sandy land.

If the proposed orchard site contains boulders or stumps, it is best to remove them before the trees are planted and so avoid breaking or injuring the young trees, accidents that are almost certain to occur if large rocks or stumps are removed after the orchard is set. If the land is rough, it is often desirable to grow

a crop of corn or any tilled crop a year before the trees are set, sowing clover or other legumes at the last cultivation of the crop. I consider it very important to fit the land properly before planting the orchard; far better wait a year than to set in poorly prepared land.

VARIETIES

With the orchard site selected and the land properly fitted, we must decide on what varieties to set. Here again, a poor selection means failure, and no amount of work can atone for a mistake. If the peaches are grown for shipment to distant markets, enough of each variety should be planted to produce carlots; if the markets are closer, or express rates are not too high, more varieties can be planted and smaller lots shipped.

The larger markets prefer a yellow peach; local markets can often be educated to take the better quality white fruit. As a rule, the white varieties are better bearers and more hardy than the yellow sorts. A variety may succeed in one section and be an utter failure in another, hence no list of varieties can be given. Find out what varieties do well in neighboring orchards and confine the large plantings to these; have a trial orchard and test out all new and untried varieties before planting them on a large scale.

DISTANCE BETWEEN TREES

Peach trees are set from fifteen to twenty-two feet apart each way, depending on soil and methods of pruning. Generally, they are planted too close. If set a good distance apart it is not only easier to care for the orchard, but the fruit develops better, as each tree has more air and sunshine and more moisture for the roots. If the land is reasonably level it can be marked out with a marker and furrows plowed each way, the trees being set at the intersections. If rough, the orchard must be lined out, sighting practiced and a measuring pole used. Whichever method is followed, the rows should be as straight as possible, for if crooked the young trees are more likely to be injured in cultivation.

IMPORTANCE OF GOOD STOCK AND LOW HEADING

Nursery stock should be fresh and in good condition; if injured by freezing or drying out at any time, it is very difficult

to produce a creditable orchard. Most commercial orchardists prefer to head the trees moderately low — from one to two and a half feet high. This low head reduces the cost of spraying and harvesting. The trees should be cut off at a height desired to form the head, and the side limbs either shortened in or entirely removed. All broken roots should be removed and remaining roots shortened to six to ten inches long. Any trees showing badly deformed main root, root knot, or crown gall should be burned. Trees should be carefully examined for borers at the time of setting; this task is often neglected and borers thus obtain a start in the orchard. Yearling trees of medium size are generally used, although in the south June buds are often used.

MANNER OF SETTING TREES .

A good-sized hole should be dug, and the trees should be planted an inch deeper than they grew in the nursery. Good top soil should be carefully worked in among the roots and packed very firmly around them. This is very important; at the same time, it must be left loose on top to act as a mulch and conserve the moisture. If the trees are planted late or if the soil is very dry, water may be poured around the roots, but generally this is neither helpful nor necessary. A little commercial fertilizer may be sprinkled on top of the ground, but under no conditions should any be placed in the hole with the tree roots. After planting, a mulch of coarse manure or litter may be spread around the tree. This will conserve moisture, which is needed for the first year far more than is fertilizer.

CULTIVATION AND INTERCROPPING

The first summer any hoed crop can be grown among the trees, provided it is not planted too close to them. The trees should be hoed or cultivated frequently, perhaps every ten days until midsummer, after which they should be left alone to allow them to ripen their wood properly. Many a promising young orchard has been ruined by sowing a grain crop among the trees; like growing a runt pig or calf, getting an orchard started properly is nearly impossible if it has once been set back.

If possible, sow a legume in the hoed crop; sow it by all means

if no other crop is grown. This will add vegetable matter and nitrogen to the soil. The cover crop should be plowed under the following spring before it has grown enough to dry out the soil. Hoed crops may also be grown among the trees the second year. The third summer any cultivated crop can be grown, but generally the trees need all the space. Cultivation should start early and cease in midsummer, care being taken not to break any large roots. On steep sidehills, strips of grass may be left to prevent soil washing.

PROTECTION FROM ANIMALS

Before winter sets in, the young tree should be banked up to prevent damage by mice and rabbits; also to prevent wind from loosening the young trees. A mound of earth around the tree prevent water from freezing around the tree collar. In northern sections, at least, it is desirable to bank the trees up for the second winter, at the end of the second season's growth.

FERTILIZERS

Early in spring, if the land is poor, manure or commercial fertilizer may be applied to the tree so as to secure an early, rapid growth. If the soil is rich, fertilizers may not be necessary, and may even be harmful by forcing too great a growth; they should be applied to produce a good growth. Fertilizers should be applied early, preferably before plowing, it being our aim not to force too great a growth and yet keep the tree thrifty. The trees should be well cultivated in the third summer, and a leguminous crop should be sown in midseason.

To fertilize a bearing orchard properly is a difficult problem, and, because of variable soils and conditions, one which each individual must work out for himself.

BORERS SHOULD BE REMOVED

The trees should be examined regularly once each year for borers. They are generally more prevalent in sandy soil and gravelly knolls and near woods. The presence of borers is indicated by the gum and shavings around the base of the tree. If any are found they should be dug out with a knife; or, if deep in

the bark, they may be hooked out with a wire. Up to the present time, anti-borer preparations have killed more trees than they have saved.

CARE WHEN FRUITING

Under favorable conditions, when the orchard is four years old, there should be a crop of fruit. The cover crop should be plowed under early, care being taken not to plow too deeply near the tree and so to injure the main roots.

Here, good judgment must be used in regard to fertilizers and cultivation, or a rank, sappy tree will be formed. Such a tree is liable to winter injury. With the present unsettled condition in the fertilizer market, it is hard to say what to use. Most fertilizers are high in price and potash is unobtainable, so that now as never before we should be sure before we go ahead. If an experienced grower, one may use what has given good results in the past; if without previous experience, use various combinations and note results. An excess of nitrogen will make large, poorly-colored fruit, and fruit that is unsatisfactory for shipping.

HARVESTING

Picking is generally done in half-bushel baskets, and the fruit is hauled into the packing shed in spring wagons. The trees should be picked over several times, the best colored and ripest fruit being taken off at each picking. Elbertas are generally cleaned at two or three pickings, while some varieties, such as Champions, may require twice as many, as the fruit ripens so unevenly. Much skill is required to pick peaches at just the proper time, and the beginner would be wise in following the better growers to know just when to pick the various varieties.

In the packing shed the fruit must be handled quickly and carefully, and each day's picking should be on the way to market by night. The various grades and sizes are determined by the market for which the fruit is intended. Various mechanical graders are used, but as a rule these are not satisfactory, except where fruit is picked while very hard. Great care must be used in all packing operations to see that the fruit is not bruised. The packed fruit should be hauled to market or railroad station on spring wagons.

The first and most important point in packing fruit is common,

everyday honesty. Everyone admits it, yet looking over the market we must admit not everyone follows his own advice, for in some unknown way the small peaches settle to the bottom. The better the pack and fruit, the more easily they may be sold for good prices.

MARKETING

We now come to the most important part of our work — marketing the fruit. An orchard may be well located and properly grown, and yet not be profitable, simply because the fruit is not properly marketed. It is a notable fact that wherever growers are far from market we find associations and marketing agencies, and wherever orchards are near markets few such organizations exist. In general, these organizations are a benefit to the grower.

No definite rules can be laid down about marketing except that the fruit must be picked honestly and handled quickly and carefully. If the fruit is to be shipped to distant markets it must be picked much greener than if it reaches the consumer the day after picking. All fruit, and peaches especially, should be very carefully handled, as a slight bruise will develop in transit into a rotten spot. Few growers handle the fruit carefully enough. Keep in close touch with the man who sells the fruit and pick it as he directs, for he can see very quickly whether you are picking it too green or too ripe.

The receiver of the fruit is a very important link in the chain of success, and the grower should get in close touch with him. Select very carefully the man who is to receive and sell the fruit.

Commission men are often called a dishonest set of men, but our personal experience with them has been very satisfactory. Select the man carefully, and then put up such a grade of fruit as he can sell to his best trade; he will very quickly see that if he doesn't give you a square deal some one else will. As in every other line of business, the man who tries to cheat others cheats himself.

A special trade can easily be established for fruit of superior quality pack. If peaches are grown only in a small way and near to market, the grower can sell them personally to stores and consumers, and secure a larger percentage of the consumer's dollar.

Whether the grower sells direct to the consumer, sells to stores, ships on commission, or sells his fruit through the auction, he should aim to have a regular supply.

It is impossible to lay down any definite rules as to just how the peaches should be graded. Aim to please the customer, and never forget that if the small, poor peaches are put in the bottom of the basket, someone will find them and afterwards avoid the brand. Put the name of the grower in every package and make every package worthy of the name.

PRUNING THE PEACH

PROFESSOR M. A. BLAKE

Horticulturist, New Jersey Experiment Station, New Brunswick, N. J.

Pruning has undoubtedly been a subject of discussion since the early days of fruit production, and yet opinion differs widely as to the best practice. The reasons for this are the variations in habit of growth of different varieties of the same kind of fruit in the same locality, variations in habit of growth of the same variety in different localities, variations in soil and climatic conditions, and fads in pruning. Some persons assert that pruning is purely an art, others that it is strictly a science, and yet when most successfully practiced it is really science and art combined.

In order to improve and insure the mechanical strength of the tree, the operation should not differ greatly anywhere, while in order to secure a uniform distribution of the fruit-bearing surface the same general plan should be followed in most cases. The severity of the pruning and the degree to which twigs and leading branches should be cut back calls for judgment on the part of each grower, however. It is commonly recognized that rate and vigor of growth directly affect the size and the color of the fruit, and the rate of growth is of course affected by the severity of the pruning. An expert grower estimates the amount of pruning necessary each season in order to obtain the best results year by year. It requires experience, good judgment, and an intimate knowledge of varieties and their habits of growth. For example, in order to obtain fruit of large size, the Hiley peach requires more severe pruning when it comes into full bearing than does the Elberta. The actual amount of wood growth pruned off in any one season, therefore, should be varied according to the amount of growth made by the trees. It is here that the ability of the fruit grower is fully tested.

There are many fads in pruning that affect the form of the tree slightly and yet have little or no economic importance as regards the size and quality of the crop. There are also extremes in pruning that decrease the yields and sometimes injure the trees.

Certain definite rules and some general ones can be given, however, for the pruning of peach trees in moderation, which will insure success if applied with judgment to meet the conditions of variety and location.

PRUNING OF NURSERY TREES AT TIME OF PLANTING

When purchased from the nursery one-year-old peach trees consist of a straight whip with few or numerous side branches, according to the vigor of the tree (Fig. 340). All experienced fruit



FIG. 340.—VIGOROUS ONE-YEAR-OLD NURSERY TREE AT LEFT; SLENDER ONE-YEAR-OLD TREE AT RIGHT; JUNE BUD IN CENTER

growers admit that the trees should be cut back severely at time of planting, but opinion differs as to whether the head of the tree should be formed at 6, 12, 18, 24, or 30 inches from the ground. The assertion that the more severely the tree is cut back at time of planting the easier it will be to gather the fruit, has little basis of fact. It is impossible to obtain first-class fruit in quantity on secondary side branches that start out within less than three feet from the ground. Trees that branch freely at the surface of the

ground are also troublesome in harboring the borer, an insect that proves much more difficult to control than the San José scale, if it is especially prevalent.

The type of secondary pruning adopted is also of much more importance in maintaining fruit production close to the ground than is a matter of six inches or more in the length of the trunk. In many orchards it has been demonstrated that a tree with a trunk twenty inches high is as easy to spray and manage and harvest as one with a trunk six inches high. Too much importance is often placed on the exact height of the trunk. If it measures anywhere from six to twenty or even twenty-four inches, a tree that is economical to manage can be produced. The writer does not favor cutting the trees back to six-inch stubs, since it is difficult to remove borers from such trees and experiments show that trees of large caliper make less growth the first season when cut back as severely as this. Trees with trunks from 36 to 48 inches in length, however, are more likely to be blown over by high winds than are trees with shorter trunks. A slender nursery tree of five-eighths- to three-and-four-tenths-inch caliper will have but few slender side branches below the point where it is cut back at time of planting, and these may as well be pruned off. If the tree is heavily branched, the side branches below the point of heading-back may be cut to from four to six-inch stubs. All large roots should be cut off smoothly so that they will be about six inches in length.

PRUNING AT CLOSE OF FIRST SEASON

Very little or no summer pruning should be done during the first summer after planting. If shoots develop low down on the trunk as well as at the top, however, they may be rubbed off soon after they develop, but during the first summer thinning out of the number of branches that form the head is not advised, since it is almost certain to reduce the vigor of the tree.

In the dormant season following the first summer's growth after planting, the first real pruning of the orchard begins. At this time the fruit grower should select the main branches that are to form the framework of the tree in future years, and on the character of the selection made largely depends the future strength of the tree and its ability to produce heavy crops without serious

breakage of branches. Before beginning the work of pruning one should decide as to the height of head or length of trunk preferred, even though this is determined to a considerable extent by pruning at time of planting.

It might be supposed, for example, that one preferred to have the main branches formed within from 16 to 24 inches from the ground. As the tree is approached the best two, three, or four well-placed branches between those distances could be chosen and all other branches immediately pruned off. This simplifies matters and results in rapid and economic work.

Number of Branches to Form the Head of the Tree

Definite rules are sometimes formulated as to the number of branches that should form the head of the tree. Three has been the number most commonly insisted on, and yet exactly the same number in each case is not of economic importance. A few facts that have a bearing on this point may be set forth as follows:

1. More than two main branches are desirable even if well placed, for in such a case the entire load of fruit must be supported at two points. Strong trees can be built with two main branches, however, under some conditions.

2. Three or four main branches allow for a good balance of the top.

3. More than four branches of large size tend to encourage the formation of too thick a top, although a few small branches that are not really leaders do not affect the problem in any material degree.

4. A slender, flat-topped, or relatively small growing variety, such as Waddell, Greensboro, or Smock, might well be allowed to



FIG. 341.— WELL-FORMED, COMPACT ONE-YEAR-OLD TREE IN THE ORCHARD; SHOULD NOT BE SEVERELY CUT BACK

form a greater number of main branches than a large, upright, thick-topped variety, such as Stump, Reeves, or Late Crawford. One arrangement to be avoided is the selection of branches that issue at exactly the same point on the trunk although on opposite sides. This commonly results in a weak tree structure, especially if the nursery tree as planted died back slightly at the top.



FIG. 342.—REEVES TREE NOT CUT BACK DURING ITS GROWTH. IT LACKS STRENGTH AND IS DIFFICULT TO SPRAY WELL

Cutting Back the Branches

After one has selected the main branches, the next question is to decide how severely they shall be cut back in the first season, if

at all. It should first be determined how such pruning will affect the development of the tree. An upright growing variety tends to make a high-topped tree that is easily broken by heavy crops of fruit, if the leading branches are not cut back and the bearing surface becomes higher from the ground each year. On the other hand, a flat-topped variety may become too spreading and flat if allowed to grow without any cutting back of the tips of branches. A slight cutting back of the tips of the main branches of a one-year-old tree tends to make the top more compact, causes the leaders to form more secondary branches, and results in a stronger tree that is less subject to breakage. Too severe a cutting back of the main branches, however, causes a thick, vigorous twig growth that is undesirable and delays fruiting.



FIG. 343.— ONE-YEAR-OLD TREE BEFORE PRUNING

The following statements may be followed for guidance:

1. A well-formed, compact, one-year-old tree,* (Fig. 341) should receive only a slight cutting back of from six to ten inches on each leader to the first good side branch.
2. Certain trees are poorly balanced, having a long branch on one side and a short branch on the other. In such a case the short branch should be cut little if at all, while the long branch should be cut severely enough nearly to balance the tree.
3. Occasional trees may form a single shoot growing irregularly or perhaps without side branches. Such a branch, or shoot, should be cut back to the point where one desires the head or main branches of the tree to form.

* The term "one-year-old" is applied to trees that have made one season's growth in the orchard.

From the foregoing discussion it will be seen that severe cutting back of one-year-old trees is permissible only in the case of irregular and poorly formed trees. It is advisable, however, at least to cut off the terminal bud on the main branches of even, well-formed trees.

PRUNING DURING THE SECOND AND THIRD YEARS

In some cases summer pruning may be of great value in securing well-formed trees without resorting to severe winter pruning.



FIG. 344.—ONE-YEAR-OLD TREE AFTER PRUNING. TIPS OF BRANCHES SHOULD BE CUT BACK SLIGHTLY.

At the close of the first season's growth irregular trees may have required severe pruning, and this may induce the production of numerous shoots and suckers, many of which are not desired and cause the top of the tree to become too dense. When the trees first begin to make growth in early spring, such extra shoots can be quickly rubbed off with the fingers; much time can thus be saved in pruning later. The severe thinning out of twigs and shoots in midsummer is not recommended, however. In case the suckers were not

rubbed off as they formed, summer pruning might be practiced to remove them as late as July, but the work should have been done previously as the shoots form.

If a young tree is making an irregular growth, the tips of leading shoots may be pinched off not later than July, and a better-branched top may thus be obtained. A general clipping, or cutting back, of the shoots of well-formed trees is not recommended in summer, however, nor is pruning advisable after the third summer when the tops of all trees should be well formed.

PRUNING IN DORMANT SEASON AFTER THE FIRST YEAR

At the close of the second season's growth the trees will have formed many secondary branches, and the leaders will have increased in height. Pruning should then consist principally in cutting off any large twigs or shoots that grow directly inward toward the center of the tree or upward in the center of the tree, and should include a certain amount of cutting back. Nothing is gained, however, by pruning off every little twig on the inside of the top of the tree and leaving the main branches bare. The small twigs will not become leaders and may produce fruit. When two side branches occupy much the same space or cross one another, a choice should be made and one of them removed.



FIG. 345.— BY SOME CUTTING BACK OF BRANCHES, MORE COMPACT TREES ARE FORMED

The severity of the cutting back of the branches should be based on the age and the variety of the tree and the amount of growth that has been made the previous season. During the second and third seasons, the tree is still in the formative stage and leading

branches should be cut back to the first or second good side branch, a practice that will result in a better spread to the top and permit better exposure to sunlight. This will not require a more severe cutting back than from ten to fourteen inches on well-formed trees. In cases of irregular growth more severe pruning may be necessary. All side branches that have made a growth of from eight to eighteen inches and are well set with the fruit buds should be cut back from six to eight inches. This will thin the set of fruit, but will increase its size and will also keep the tree vigorous.

In pruning the peach the following facts should be kept in mind:

1. During the first three years severe pruning tends to delay fruiting and to decrease the yield.

2. Moderate pruning increases the strength and vigor of the trees without reducing the yield of fine fruit.

3. No pruning tends to early fruiting and maximum yields of smaller fruit, but results in weaker trees that are subject to break age and a shorter commercial life.

4. As the trees come into full bearing, a more severe cutting back of the annual growth should be practiced during the dormant season. The result of such practice will be larger fruit, less expense for thinning, and more vigorous trees.

5. As a general rule one might say that about one-half of the previous season's growth should be cut off each twig, but this should be varied at times and the fruit grower must make a study of the effects of pruning so that he may properly judge conditions each season. The formal shearing of the tops of peach trees to make them appear like a hedge is not considered good practice.

PRUNING FOLLOWING WINTER INJURY

When fruit buds are destroyed by unfavorable weather during winter and early spring, a more severe cutting back of the trees is advisable. This is especially true if some winterkilling of the twigs has occurred. Even in mild forms of winter injury the trees are likely to be somewhat weakened. In cases where nearly all the fruit buds are killed on trees in full bearing, it is well to cut away practically all of the previous season's growth, and if the winter injury is at all severe, to cut well into the two-year-old wood.

PRUNING OF OLD TREES

After the peach has been growing from eight to ten years in the orchard, the trees may carry a considerable amount of weak growth or have become too small to spray and harvest easily, especially if the annual pruning has been neglected for one year. In such a case severe cutting back of all branches during the dormant season will result in a new and vigorous top growth that will extend the commercial life of the orchard. Under such circumstances the pruning should extend into the three- and four-year-old wood. Trees are sometimes cut back almost to the trunk, leaving short stubs of branches that may be four inches or more in diameter. Such a severe practice is seldom productive of the best results.

QUALITY OF THE PRUNING WORK

It appears hardly necessary to emphasize the fact that the thoroughness with which pruning is done determines the value of the work and that all large branches should be cut off smoothly, since dead or dying branches and stubs form breeding places for bark beetles and other orchard enemies. Trees of medium size in full bearing can generally be pruned at the rate of from four to six trees an hour, this operation including the cutting back of the branches. Trees with low tops can be pruned with shears, but large trees make the use of the hand, or pole, pruner necessary in order to do the work rapidly without a stepladder.

During the dormant season all pruning should be completed before spraying for scale and leaf curl begins, since it reduces the amount of time and material required for the work. Branches and twigs cut off in pruning should be gathered together and burned in order to prevent the spread of insects and diseases and to clear the orchard of material that will interfere with the work of spraying and cultivation.

INSECTS AND DISEASES OF THE PEACH

L. F. STRICKLAND

Horticultural Inspector, Department of Agriculture, Albany, N. Y.



Like other deciduous fruits, the peach has its pests and diseases. In the following article the writer mentions certain points not commonly emphasized in scientific literature, but points which in practice are found to be particularly valuable. Field workers often find that, in combating pests and diseases, the growers have varying degrees of success. In many cases this may not be entirely due to lack of thoroughness in their methods, but to a lack of knowledge of important points in the life history of pests or diseases.

INSECTS

In this latitude the peach is attacked by eight distinctive insects, four of which are minor in importance. In this bulletin these insects will be considered in the order of importance in New York.

Black Peach Aphis

The black peach aphid (*Aphis persicae* Niger Fr Sm.) infests the tender leaves and shoots of the peach, although the serious injury occurs on the roots. Its presence on the roots is suspected when the leaves of individual trees take on a yellowed sickly appearance, each leaf of the affected tree being yellowish green, except the area along each midrib and lateral veins, which is dark green. The leaves develop to normal size, growth is checked, and serious infestations even indirectly cause the death of the young trees. Blocks of nursery stock are often found slightly infested, but the main trouble comes one, two, three, and four years from planting. Here in the north older trees are seldom found seriously infested.

There are other factors that are supposed to cause similar foliage



PLATE No. 1.
EARLY CRAWFORD.
First Year Yellows.
 $\frac{1}{2}$ Natural Size.

characters, as for example the use of too much nitrogenous fertilizer. From personal experience it may be stated that close examination of the roots of such trees often proves that there is no infestation of aphids, and inquiry has sometimes revealed that no fertilizers have been used around the trees. It is fair to suspect black aphid, however, when the foliage presents the leaf characteristics.

In New York the insect appears to desire the environment of our sharp lake sands, being less often found in gravel, stony, clay, or clay loam soils. The aphids obtain their food as do all other aphids, namely, by sucking the sap from the leaves or roots of the trees. Each mature aphid gives birth to living young, so that under favorable conditions multiplication takes place rapidly.

Methods of control. Nurserymen and fruit growers alike should always practice fumigation of peach stock. Thorough fumigation will eliminate this pest as well as others and, if properly conducted, will not injure the stock. Since the insect will live for some time in soil from which an infested tree has been removed, it is wise to make a heavy application of tobacco dust. One-half to one bushel of wood ashes mixed thoroughly through the soil of the infested root area will serve to eliminate soil infestation. Some growers have succeeded by stimulating the trees to rapid growth by heavy application of manure and by thorough cultivation.

Curculio

The work of the curculio (*Conotrachelus nenuphar* Hbst.) is noted on the fruit. The pest stings the peach sometimes to obtain food and at other times to make a crescent-shaped groove in which to deposit an egg. The saps flow freely out through the wound and cause gumlike drops to form on the surface of the fruit.

Occasionally the attacks of the pest are serious; causing deformed and wormy fruit (Fig. 346, b).

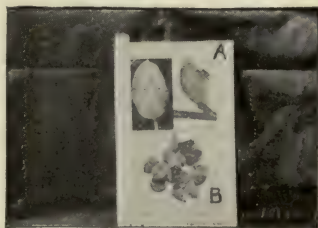


FIG. 346.—THE CURCULIO:
(a) CURCULIO AT WORK;
(b) WORMY FRUIT

Methods of Control. Curculios in greater or less numbers are always present in fruit orchards. It is a question whether preventive measures would be economical with the slight infestation common in New York orchards. During yearly inspection of peach orchards it is apparent that the largest infestations take place where the orchard parallels a plum block. In such a case it would seem wise to control the curculio in the plum block. This can be done by applying a poisoned spray as soon as the first curculio mark shows on the plum, using the following formula: lime-sulphur, 1 gallon; arsenate of lead, 3 pounds; water, 60 gallons.

Plant Bugs

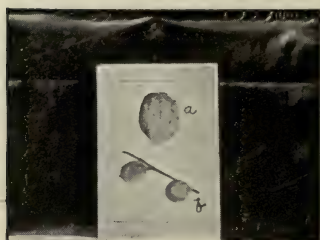


FIG. 347.—WORK OF A PLANT BUG

Both the plant bugs (*Lygus pratensis* L. and *Lygus invitus* Say) cause more or less injury to the fruit. The former species in particular causes severe damage to peach trees in the nursery row. It is a sucking insect, and both nymphs and adults are exceedingly active bugs. This characteristic makes treatment of the pest very unsatisfactory.

The second species is apparently the cause of most of the trouble in the orchard, regarding which growers are puzzled when gum forms on the surface of the fruit. Several things may cause this. The writer has often observed injuries on the peach through which the exudation of sap was taking place, and has commonly found peaches along a woodland to be thus affected, while very little injury appeared elsewhere in the orchard. In such cases examination has shown that the injury was not that of curculio. Since Professor Parrot and Mr. Hodgkiss* discovered that *L. invitus*, the false tarnished plant bug, causes such gumming on the fruit in confinement, it is reasonable to suspect that the same insect is the cause of the trouble in orchards near woodlands or fence rows. The insect that causes most of the trouble is a sucking insect. If this pest is the false tarnished plant bug, it closely resembles the former species.

* Bul. 368, N. Y. Exp. Sta.—The False Tarnished Plant Bug as a Pear Pest.



PLATE No. 2.
EARLY CRAWFORD.
Third Year Yellows Foliage.
 $\frac{1}{2}$ Natural Size.

Control. When much injury continually occurs to the fruit, the environment of the peach should be changed by eradicating the sumach and wild grapevines along the border of the orchard. It does not appear necessary or practical to take further precautions for the trouble.

San José Scale

A knowledge of the importance of San José Scale (*Aspidiotus perniciosus* Comst.) is necessary, because the peach is one of the favorite hosts of the insect. When scale first appeared in the orchards of western New York, growers thought their orchards were doomed. Many growers have found the pest difficult to control, but it can be rightly said that its inroads have been a blessing in disguise to the fruit grower because they have taught him the value of sprays and forced thoroughness into his work. A description of the insect will be found on page 1022.

Control. Even if a tree has become injured, it is possible to kill the scale by a thorough application of spray. Lime-sulphur has long been a standard spray for the purpose, not only because it will kill scale but because it will also check leaf curl and is not dangerous. If trees are thoroughly infested or are subject to infestation, the lime-sulphur should be used as follows: lime-sulphur, 32 degrees Baume, 1 gallon; water, 8 gallons.

On peaches it is not advisable to use other sprays for scale. The application of the formula recommended should be made late in fall after the leaves have fallen or early in spring before the tip, or terminal, buds burst. As a majority of the scale living over winter are on the under side of the limbs and branches, it is imperative that a thorough application should be given to the under surface, and that all branches, both the top and the bottom thereof, must be covered.

Borers

There are several kinds of borers that infest and seriously injure peach trees under conditions favorable to the pest, but only two of these are generally recognized by growers as being distinct species. The two commonly known species are shot-hole and peach-tree borers. Two other species are also common in New York, the peach-twig borer and the lesser peach-tree borer.

The latter species especially is often confused with the peach-tree borer as will be noted in the following descriptions:

The Peach Twig-borer. While this borer (*Anarsia Lineatella* Zell.) can generally be found in the orchards of western New York, it has not become a serious pest. In California, Oregon, and Washington, it is credited with severe damage. In New York it inhabits poorly sprayed or unsprayed trees, being infrequent in orchards that are thoroughly treated with lime-sulphur solution when dormant. The principal work of this species is feeding early in spring on the new shoots. In California * and other western states, the larva feeds in the fruit also, causing wormy peaches. In New York, however, the writer has never noted the species in the fruit, but its work on the young shoots is common.

The small larva of the twig-borer lives over winter in the thick tissues of the crotches of the limbs. In spring, at about the time the buds swell and burst, the larvae come forth and feed in the pithy centers of the young shoots, causing them to wither and die. The larvae soon become full-grown, pupate, and later come forth as moths.

Control. In New York conditions do not warrant special precautions against this insect. As stated above the usual spring application of lime-sulphur wash appears to control infestations. The work of the larva in the crotches of the trees is limited and has never been noted to cause oozing of the sap.

The Lesser Peach Borer. This borer (*Synanthedon pictipes* G. & R.) is easily confused with the large peach borer that makes its entrance around the crown of the trees. The lesser peach borer is found throughout the eastern United States and is particularly abundant in western New York and the lake portions of Canada. It generally inhabits the trunks and large gummy wounds on the main limbs and frequently is found in injuries caused by the large peach borer.

When mature, the larva, or borer, is about three-quarters of an inch in length and is not as large in diameter as is the peach borer. It feeds on the inner bark, making large channels and tending to enlarge the wounds by eating around the edges. In New York the larvae become full-grown in early July. They crawl out

*Reprint Yearbook U. S. Dept. of Agr., 1905.



(a) Premature.



(b) Normal.

ELBERTA.



(d) Normal.
STEVENS RARE-RIPE.



(c) Prematures.

PLATE No. 3.
Premature and Normal.
Natural Size.

near the edge of the wound, there spin a cocoon consisting of web and chewed bark, and pass into the pupa state. In about ten days the larvae have changed to adult moths and might be mistaken for small wasps, both males and females of the species appearing much alike (Fig. 350). The eggs of the moth are deposited on the bark, the adults preferring to place them near wounds from which gum has formed. The eggs soon hatch, and the young larvae resume work in the wound. The canker caused by the brown-rot fungus is a frequent haunt for this borer.

Control. The lesser peach borer can be controlled by yearly examination of cankers and wounds and by the killing of the larvae in the early part of June. During the last of June and early in July the larvae are passing into the pupa state and are not generally recognized or easily found by the grower.

As an agency to prevent the entrance of the young larvae after they have hatched, it has been noted that wherever a grower cleaned out the wound and applied a strong thickened lime-sulphur solution, the work of this species was very limited. As used in western New York the solution consists of the following: concentrated lime-sulphur, 2 gallons; water, one-half to 1 gallon; lime added to make a thick wash. Either air-slaked lime or thick milk of lime is used to thicken the concentrate. The thick milk of lime seems to adhere to the trees much better, however, and lasts a longer time.

Shot-hole, or Bark, Beetles. These two bark beetles (*Phloeotribus liminaris* Harr. and *Scolytus rugulosus* Ratz.), commonly known as shot-hole borers, are equally prevalent in western New York. The first species is apparently more destructive, but both cause considerable yearly loss of peach trees, so that the principal method of control is by continually preventing favorable breeding places. In eastern New York the latter species is the most common. In this state both insects have similar breeding periods. In September the beetles, which are small black bugs about one-sixteenth of an inch long, attack weakened and sometimes healthy trees. They bore a small round hole in the bark, in many cases an eighth of an inch deep, causing large quantities of gum to form on the surface (Fig. 348.). The loss of sap is the serious part of the injury. Many of the burrows serve as hibernating

quarters for the winter, and in spring lateral nicks are made in which eggs are deposited that soon hatch, the young larvae maturing about June first. The adults then migrate and make fresh entrances, depositing eggs from which the young mature about



FIG. 348.—WORK OF THE SHOT-HOLE BORER (*Phlæotribus liminaris*)
On the left is shown the gum that is formed on the surface of the bark; on the right, the holes from which the adults emerge

September first, thus making two broods of the pest during the summer months. In Fig. 348 are shown the gumming and the holes from which adults emerge.

The first-named species, *Phlæotribus liminaris* Harr., is more serious because in the construction of its channels (Fig. 349) the

main burrow runs around the limb while the laterals run lengthwise of the branch. Thus the sap supply is cut off, and the exudation is greater. In western New York this species attacks healthy trees to a greater extent than does the closely allied species, *Scolytus rugulosus*.

The latter species seems to prefer dead, or partially dead, wood and does not as often attack healthy trees. The adults of this species make vertical bores in the bark, and although the larvae begin by boring along the sides of the vertical channel, they gradually curve their course and go more or less lengthwise of the limb. In Fig. 349, the course of the main chamber and the vertical tendency of the lateral bores should be noted.

Measure of Control. Since both borers cause considerable loss of peach trees in peach sections, it is wise for growers to ward against having a breeding ground in the vicinity of a peach orchard. The writer has often seen peach stumps piled on one side of the orchard and left until fall.

The borers had bred in the bark of the stumps or brush if the source happened to be from brush, and about September first, had migrated from the dry peach wood to healthy or weak trees nearest to the pile.

In the western part of the state, examination was made in one instance of borers that had migrated from a pile of peach brush northeast of a three-year-old orchard to trees on the northeast corner of that orchard. The infestation was heavy, and the boring



FIG. 349.—CHANNELS MADE BY THE SHOT-HOLE BORER (*Phlaeotribus liminaris*)

of the beetles for winter quarters caused the healthy young trees to lose a large amount of sap. In some cases the ground was covered with gum. By the next spring two hundred and fifty of the trees were dead, for freezing winter weather had sapped the remaining moisture of the trees.

It is always easy to trace the source of an infestation by noting the direction from which the insects came. The following precautions should be taken:

1. Burn all refuse wood or brush before June first and September first. Leave no such refuse near peach orchards at those periods.

2. All frozen or otherwise weak trees that will never recuperate should be removed and destroyed between June first and September first.

3. Healthy trees seriously injured by fall or spring broods may be cut back and stimulated by the application of manure to the soil.

4. If trees about woodlots or buildings are subject to continued attacks from various sources, an application to the bodies and limbs of the trees of the solution recommended for the lesser peach borer on page 1097 will check the work of the adults. The wash should be applied just before June first and September first.

Peach-Tree Borer. This insect (*Sanninoidea exitiosa* Say.), the most serious enemy of the peach in New York, is one of our native insects. Originally, it undoubtedly inhabited our native plum and cherry trees, but when the peach was introduced into this country by our forefathers the insect immediately began to infest the peach tree, and today is generally established in every peach section east of the Rocky Mountains.

This borer differs from the lesser peach-tree borer in that its common place of attack is at the crown of the tree, and it is a very heavy feeder. In western New York trees that are located in the heavy gravel or stony loam soils are frequently badly infested with this species. The pest is never serious in trees on clay soils. It is apparent therefore that the insect needs an open soil condition as a natural environment.

The full-grown larva of this species is a white or light yellow grub about an inch in length and one-eighth inch in diameter. The head and first segment are brown. The larvae cause much irritation, which is followed by an exudation of sap that fills the



CARMAN.



DEWEY.

PLATE No. 4.
Normal Colorations.
Natural Size.

cavity and flows out in large masses around the crown of the trees. They become mature during the summer and crawl out of the bark close to the surface of the soil or the exudation, spin a cocoon of web and borings, and there pass into the pupa stage

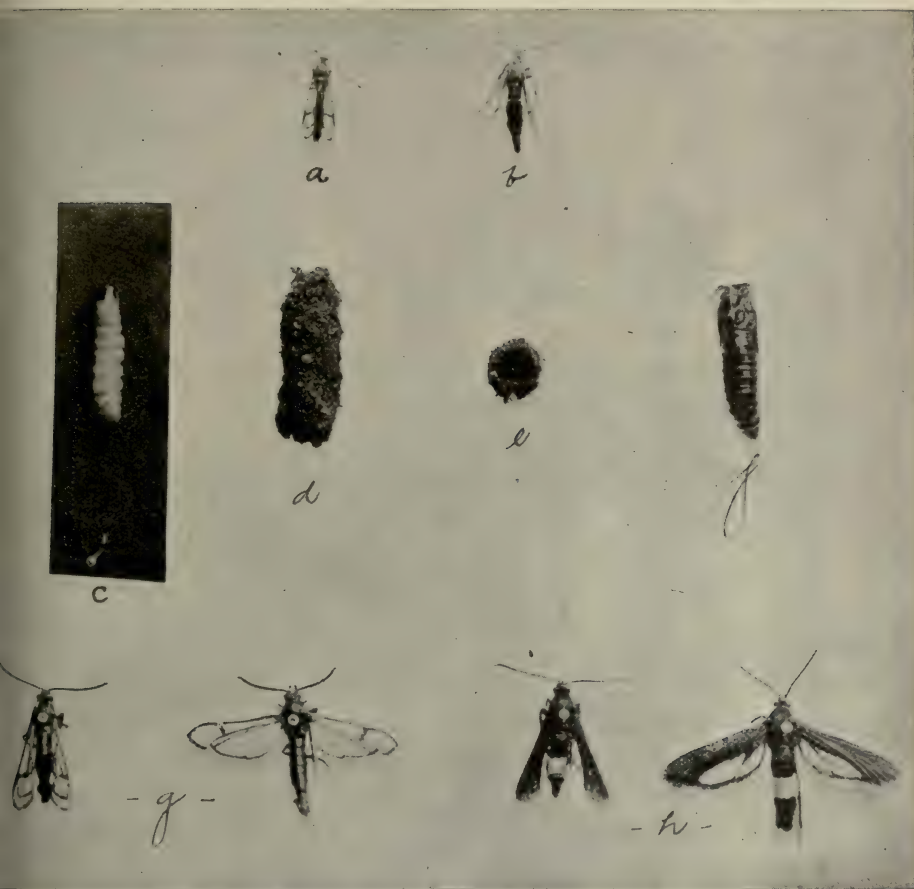


FIG. 350.—THE LESSER PEACH BORER AND THE PEACH-TREE BORER

(a and b) Male and female of the lesser peach borer (*Synanthedon pictipes* G. & R.). (c to h) Various views of the stages of the peach-tree borer: (c) larva; (d) pupa in case (e) empty cocoon; (f) pupa skin; (g) adult males; (h) adult females

(Fig. 350, d), soon to emerge as adult moths. According to Slingerland very few moths emerge before July first, and they mostly appear from July 15 to August 15. In 1905, Professor A. L. Quaintance* reports that Mr. Johnson found the period of

* Reprint, Yearbook, U. S. Dept. of Agr. 1905.

emergence of the adult at Youngstown, New York, to be from June 12 to August 24.

There being a lack of knowledge among growers on this point, the writer has secured the following data in the Olcott section over a period of four years:

1912.— Trees located on gravel and stony loam soils. Largest number of borers remained in pupa form between August 3 and August 7, but emerged soon after.

1913.— Larvae were passing evenly into the pupa state through the last half of July and the first half of August.

1914.— Pupae were found in largest numbers in orchards seriously infested on August 6.

1915.— Most of the borers had left or were leaving the pupa case on August 10. On heavier soils no larvae had passed into the pupa state.

The adults of this species would not be recognized as moths except by an expert, being wasplike in appearance. The female is an exceedingly active flyer, the greater part of her wings and body being steel-blue in color. She is adorned with a broad, bright orange-colored band across the abdomen (Fig. 350, h). The male is a smaller insect with transparent wings bordered with steel-blue, his body is slender and unadorned but of the same blue color. The males of this species might easily be confused with the adults of the lesser peach borer.

Quaintance states that from 200 to 300 eggs have been found in the bodies of the females. The eggs are small and yellowish brown. They are deposited on the bark, especially around an exuding wound. The eggs soon hatch, and the young larvae enter the bark very largely through the exuding gum from a wound. They will enter, however, directly through the bark just below the surface of the ground.

Control. Many methods have been tried out in order to kill the borer or to prevent it from entering the trees. Most of these methods have proved costly and ineffective. No material nor device has been found to destroy the pest, but a few preventive measures are generally adopted in the peach sections of New York.

1. Between June 15 and July 15, the soil is removed from the crown of the trees and the bark examined with a knife to find and



(a).

PLATE No. 5.

The two general types of peach foliage:

(a) ELBERTA.

(b) CRAWFORD.

$\frac{1}{2}$ Natural Size.

(b).

destroy all larvae. This practice should not be followed later than July 15.

2. As soon as the bark or wound is dry, an application of the thickened lime-sulphur solution recommended for the lesser peach borer on page 1099 is made. The crown and about eighteen inches of the trunk should be thoroughly whitewashed with the solution.

3. As soon as the trees are dry, the soil is piled back against the trees forming a mound about six or eight inches high (Fig. 351). The mounding forces the female to deposit her eggs higher on the trunk of the tree, thus causing more unfavorable conditions for the larvae and placing them in an easier position to remove. It also serves to prevent frost injury (page 1113). Many growers make the serious mistake of leaving the soil hoed away from the crowns of the trees. The mounds should be made prior to August 1, before the adult deposits her eggs.



FIG. 351.—MOUNDING OF PEACH TREES TO CHECK BORERS AND PREVENT FREEZING

It will be noticed that the pupa stage of this insect during the years 1912, 1913, 1914, and 1915, varied somewhat, and that only during the year 1913 did the pupa stage last over an extended period of time. During the other three years the greatest number of the larvae were in the pupa stage from August 3 to August 10. It is believed therefore that many times the grower would have an opportunity to kill large numbers of the pupae between August 1 and August 10. The writer has often removed the soil from the crown of trees during this period of the four years and found from one to seventeen living pupae. If trees on gravel or stony loam soil have a serious infestation of the pest, it is rapid work with a trowel or similar instrument to remove the soil, carefully examining the same for the pupae. They are easily found especially if the soil is dry and loose. No cutting of the bark is necessary.

DISEASES

In New York State the peach is subject to nine maladies, seven of which are distinct diseases. The natural order of these so-called diseases are crown gall, powdery mildew, peach spot, or scab, shot hole of peach foliage, brown rot, peach leaf curl, yellows, little peach and frost injury.



FIG. 352.—CROWN GALL, ILLUSTRATING ITS APPEARANCE ON DIFFERENT TREES AND PLANTS

Crown Gall

Peaches are subject to various gall-like formations. They are known as root knot, aphid galls, and the true crown gall. The first is caused by an eel worm or nematode,* the second by the black peach aphid, and the third by a parasitic organism. Crown

* Farm Bul. 33, 1895, U. S. Dept. of Agr.

galls grow to be as large as two inches in diameter. Nursery stock is occasionally found badly infested, although the disease does not seem to be seriously contagious in this state. The galls are soft and spongy and are generally situated at the crown or on the large roots. Trees affected with galls should not be planted unless the galls can be cut off without too much loss of roots.

Powdery Mildew

This fungous disease (*Sphaerotheca pannosa* [Wallr.] Lev.) lives for the most part on the surface of the plant, sending its rootlike hostoria into the cells of the host to take up its nourishment. The light gray growth is the fungus itself. It often attacks young trees in the orchard during the first, second, and third years growth, especially when the trees are on rather low wet ground. Old trees that have been severely dehorned and forced into rapid growth are subject to mildew particularly when growth is thick and compact. The fungus takes the sap out of the leaves, thereby checking the growth and causing the foliage to turn a grayish brown. The edges of the leaves may roll, gradually dry, and crack. Powdery mildew is common in western New York orchards.

Control. Growers do not practice using spray to control this disease of the peach. The trees affected are usually young and nonbearing, and have grown sufficiently for the season by the time the fungus appears. It is not usually necessary to spray for the powdery mildew on the peach.

Peach Spot, or Scab

Peach spot, or scab, (*Cladosporium carpophilum* Thum.), is a very common disease in this state. In years when rainfall is heavy during the summer season, it is favorable for the disease. Usually the infection occurs during the latter half of July or the first half of August, taking place on the side of the peach that lies uppermost. Many varieties, such as Carman, Champion, Yellow St. John, Elberta, Salway, and Hills Chili are susceptible, but Yellow St. John, Salway, and Hills Chili are invariably so.

Control. The disease is not common since the use of bordeaux mixture has been discontinued to make a spraying for peach scab.

With very susceptible varieties, such as the St. John, especially when it is grown for a fancy market, it would be advisable to make a spraying to check the disease. For this purpose no better spray could be used than Scott's self-boiled lime-sulphur mixture* which is made as follows: Fresh stone lime, 8 pounds; sulphur (flowers or flour), 8 pounds; water, 50 gallons.

Usually more than 50 gallons are needed, and in such a case the above formula can be made 32-32-200. The lump lime can be placed in a barrel and enough water added almost to cover the lime. As the lime begins to slake, the sulphur from which all lumps have been sifted should be added. More water also is added to keep the mixture from burning dry. When natural boiling by the lime ceases, the remaining amount of water should be added and the application made. If properly prepared, the mixture should not burn the foliage.

Shot Hole of Peach Foliage

This disease is rather prevalent in some years. In 1897, Dr. B. M. Duggar† noted an instance of shot-hole effect on peach foliage due to weather conditions. In his notes of that date Dr. Duggar



FIG. 353.—SHOT-HOLE EFFECT ON PEACH FOLIAGE

states: "An examination of specimens of various fungi affecting the peach and plum will show that, with the exception of leaf curl, mildew, and a few others, these fungi are very generally productive of a shot-hole effect." He also adds: "This shot-hole effect is a peculiar physiological reaction of plant injuries of many kinds."

In 1900, Professor F. C. Stewart's attention was called to the shot-hole effect in peach orchards about Marlboro in the Hudson River section. Professor Stewart stated: "Certainly, the trouble was not of fungous origin. We believe it was brought about by weather conditions."

* Bul. 174, 1910, U. S. Dept. of Agr.

† Bul. 164, 1899, Cornell Univ. Agr. Exp. Sta.



PLATE No. 6.
ELBERTA.
Second Year Little Peach Disease.
 $\frac{1}{2}$ Natural Size.

A large amount of defoliation occurred in the vicinity of Olcott, New York, during July of the season of 1915, and in some sections of eastern New York in August. At Olcott nearly a quarter of the foliage was lost in several orchards. No spray had been applied to the foliage, but unusual weather conditions prevailed throughout the summer, causing heavy brown-rot infection of fruit. From the symmetry of the spots and their location along the margins of the tip third of the leaves and along the midribs, it seemed quite possible that the trouble was of fungous origin. No preventive measures are known for the difficulty, but it is seldom that the injury is so prevalent as it was during the season of 1915.*

Brown Rot

This disease (*Sclerotinia frutigena*) is the most serious fungous disease of the peach. The fungus lives over winter in the rotted peaches on the ground, producing little fruiting bodies very early in spring (Fig. 355), while in peaches that still cling to the tree, spores are developed (Fig. 354). The dissemination of the spores may cause infection of the husk enveloping the newly formed peach and the peach also. Instances have been noted in Niagara County, when almost the entire set of peaches has been destroyed by rot at this time. In many cases the fungus continues down the stem of the peach into the branch, later causing large black cankers so prevalent on Elberta in that county. Again, the infection of fruit occurs during August, especially in the early varieties, such as Champion, Carman, Triumph, or Dewey, and almost complete loss results. For the most part susceptible varieties are not very

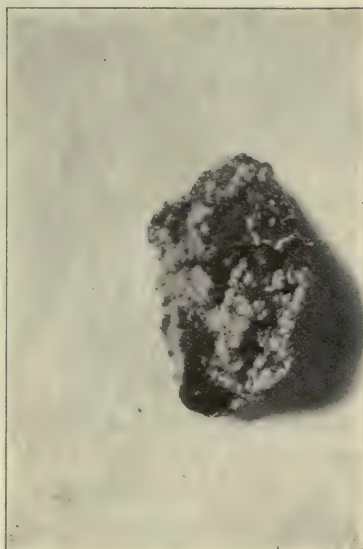


FIG. 354.—BROWN ROT OF THE PEACH

* Bul. 328, 1910, N. Y. Agr. Exp. Sta.

profitable. It is generally felt that they should not be planted for commercial use.

Control. Wherever varieties are profitable but subject to rot, applications of self-boiled lime-sulphur wash are recommended, as in the case of peach spot, or scab, page 1108. Repeated applications of the spray are advisable during the months of June and July.



FIG. 355.—SCLEROTIA STAGE OF BROWN ROT ON THE GROUND

Peach Leaf Curl

The fungus (*Exoascus deformans* Fuckl.) that causes this disease produces highly distorted foliage. The infection occurs on the leaf at the time the leaves break through the bud scales, and by the time the leaf is partly grown little red boil-like areas have developed. Later the areas increase until most of the leaf may be included. It then gradually grows

misshapen, turns grayish white, dries, and drops. Heavy defoliation often causes serious dropping of the fruit and a lack of bud formation.

Control. Leaf curl can be entirely controlled by a proper application of lime-sulphur or bordeaux mixture. Lime-sulphur solution is used for San José scale; when it is at scale strength, a thorough application made before the buds burst will completely control the trouble. If no scale is prevalent in the section, bordeaux mixture, 4-4-50, is usually cheaper and is equally effective.

Spraying can be done at any temperature above 32 degrees after the foliage has dropped in fall and until the buds burst in spring. In making spring applications, the grower should watch the development of the terminal buds, and not allow them to burst before the spray has been applied.



PLATE NO. 7.
EARLY CRAWFORD.
First Year Little Peach Disease.
 $\frac{1}{2}$ Natural Size.

Yellows

The cause of this disease is unknown. From the characters of the disease it appears to be one of bacterial origin. It is contagious to such an extent that whole orchards, or, as past records show, the orchards of a whole section will become diseased and gradually die out. This was the case in western New York about thirty years ago, and at the present time it is true in the case of certain districts of other states.

The early character* of the disease is a premature peach, designated by bright-red dappled spots on the skin of the fruit. Such specimens often develop in larger size than does the unaffected fruit of the same tree, and they ripen earlier, showing the characteristic blotches from two weeks before up to the day on which they are ready to pick. The blotches appear to be concentrations of juice just under the skin and form very slight pimples. The quality is usually poor being a stringent insipid acid. It is interesting to note the characteristic blotches and comparative size at the time the premature fruits appear (Plate 3). A single fruit on a branch or the fruits of an entire limb may show the disease at the same time. In case the whole branch shows the disease, the foliage becomes yellow as the season advances (Plate 1). During the second season the disease usually appears on other limbs of the tree or over the entire tree. In the third year less fruit sets, but both fruit and foliage have the colorations. Terminal growth is checked and often wirelike shoots with narrow leaves appear on the large limbs and frequently on the small branches (Plate 2). In the fourth year foliage is very scarce, and death follows. Compare the normal streaking of the fruit with the characteristic dapple (plates 3 and 4).

Control. Trees in which the disease appears are doomed, as no treatment has ever been found to improve their condition. The only means by which the disease can be controlled is by systematic examination and eradication of diseased trees in the orchards of a community. The results obtained in the Niagara district between 1902 and 1913* illustrate the value of destruction of diseased trees. The growers who practice removing the tree when the disease first appears are the most successful in controlling the disorder.

* Bull. 61, 1914, N. Y. Dept. of Agr., Peach Yellow and Little Peach.

Little Peach

As in the case of yellows the cause of this disease is unknown. Probably little peach has been more or less prevalent in the orchards of New York as long as yellows has, but it is certain that little peach has not been recognized as a disease nearly as long as yellows. It is equally as contagious but much harder to distinguish in its early stages. For this reason the disease is more likely to become well established in an orchard before being recognized.

The most definite early indication of the disorder is a foliage character rather than a fruit character as in the case of yellows. One who is studying the disease must first recognize that all varieties of peaches can be grouped into two distinct types of foliage, namely, the Elberta type and the Crawford type. The former have large wide slightly curved leaves with a drooping tendency. The latter have short, medium-wide, crescent-shaped leaves (Plate 5). The varieties of peaches mentioned below are placed under their respective foliage types:

Elberta

Carman
Champion
Dewey
Elberta
Greensboro
Hills Chili
Iron Mountain
Niagara
Red Cheek Melocotone
Salway
Smock
Stevens Rare-Ripe
Triumph
Yellow Bergen

Crawford

Barnard
Black Crawford
Chairs Choice
Early Crawford
Fitzgerald
Foster
Globe
Graves Early
Lady Ingold
Late Crawford
Plain Surprise
Reeves Favorite
Wheatland
Yellow St. John.

In the Elberta types the presence of this disease is manifested by the leaves below the tip being tinged with yellow and withered in appearance, while the terminal foliage remains healthy. The tip foliage remains green throughout the season. No striking difference is noted in the size of the fruit, but it will ripen a few days late.

In the second year the foliage characters are the same but are more pronounced. The effect on the fruit is easily recognized since



Third
Year.



Fourth
Year.

First Year.

EARLY CRAWFORD.

Second Year.



Third
Year.



Fourth
Year.

it is decreased to the size of a prune and ripens about two weeks late. In the third and fourth years the disease causes a decrease in foliage with more and more indefinite characters. The fruits of the third year are about the size of walnuts and seldom ripen. In the fourth year they are very small and never ripen. Death of the limb or the tree usually follows in the fourth year of the disease.

In the Crawford type during the first year the disease produces somewhat different characters. The terminal foliage is normal in color and shape, but the leaves below the tip are tinted with the same characteristic yellow common in both diseases. The tinted leaves seem to possess a drooping tendency, due to the tip third of each leaf turning back. This curving of the tip gives a clumping effect with the seeming droop. Only slight decrease is noted in the size of the fruit.

In the second year foliage characters in the Crawford type do not differ greatly from those of the first year. The fruit develops to about the size of a prune and ripens about two weeks late. In the third year the foliage is usually strikingly clinching in nature. The fruit is small and never ripens.

In the fourth year the tree brings forth very little foliage and the fruits are small. At the end of the season the result is invariably death.

Frost injury to the roots and crown may cause trees to throw out weak foliage which may easily be confused with the little-peach disease. If the grower will keep in mind the principal foliage characters, however, no mistake should be made. The entire foliage of a frozen tree is affected, which is not true usually in the case of little peach, as the terminal leaves are a healthy green in the first two years of the attack. In plates 6 and 7 the effects of the disease on the two types of foliage may be seen, and in Plate 8 the yearly effect on the fruit is indicated.

Control. The method of control is identical with that of yellows.

Frost Injury

Frost injury is described here because it is often confused with diseases of the peach. Two types of injury are considered, first, that which affects the crown and roots and, secondly, that which appears at the crotching of the trunk.

(a). Frost injury around the crown may take place among trees of all ages and in all locations, whether they are on a steep slope or on level land. The injury usually occurs in the dead of winter when the snow is on the ground. The snow, a foot or more deep on the level, blows away from the crown of the trees, after which the sun thaws the snow on the north side of the basin and the water forms a pool that later in the day freezes. The day following more snow thaws, and another layer of ice is formed. This process is repeated until the basin of ice will not crack as it would under more normal conditions. The distinguishing feature of the injury resulting to the tree is a restricted area of bark about the crown. It may extend all around the tree or only on one side. The bark dries and later offers a convenient breeding place for one of the dead-bark fungi or the borers.



FIG. 356.—FROZEN CROTCH

Control. A tree girdled in this manner cannot be saved, although it may live for several years if only partly girdled. The injuries themselves seldom, if ever, heal over, however. In western New York an important measure is taken so as to prevent such injury to peach trees as well as to other trees (Fig. 351). It has become general practice there to make a mound just before the ground freezes in fall, if it has not been made previously, to guard against the borer. In some soils, mounds made earlier

wash down, thus making it necessary to remound in the fall.

(b). The second type of injury occurs in the crotches of the trees, where large irregular cankerlike areas appear at the junction of the limbs and trunk. This injury is common in various

localities, and in some cases has affected a majority of the trees in the orchard.

Why a tree should be subject to such injury at this point is not clear. It will be remembered, however, that a section of bark of the crotch of a tree is thicker than any other area on the tree. It will also be remembered that the cells of this particular area are highly active and specialized. It is suspected that trees affected by freezing at the crotch have been extremely vigorous in the previous summer, and their wood and bark have not ripened properly. The frost thus gains access to the tree and injures the cells.

A similar canker is likely to occur from another source. Growers are sometimes in the habit of leaving a small dead stub, a part of the original trunk of the nursery tree as set, in the crotch of the tree. This stub seems to be an ideal spot for one of the deadwood fungi, a *Valsa*, to attack. The stub becomes affected with the fungus and later forms a distant canker causing very weak crotches. This fungous canker can be distinguished from frost injury of the crotch by the fact that in the former case minute round-headed fruiting bodies of the fungus form in the bark. In young trees all such stubs (Fig. 357, at



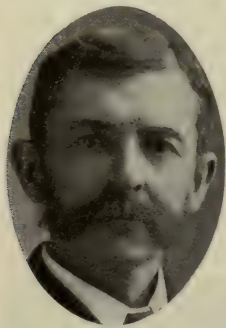
FIG. 357.— FUNGUSED STUB CANKER

a) should be carefully removed as soon as the lateral buds of the newly set tree have started. Such forms of cankers are the most frequent cause for the breaking down of trees in later years.

PACKING AND MARKETING THE PEACH

A. G. GULLEY

Professor of Horticulture, Connecticut Agricultural College, Storrs, Conn.



Our methods of marketing are only applicable to conditions similar to our own, which can be found in many places in southern New England and probably in other sections in the east, where producer and consumer are near each other. In this section two manufacturing centers are within easy carrying distance, one of which is much larger and somewhat farther away, while several small plants having many consumers are very convenient. These are all largely dependent on outside producers, and in a section capable of growing the fruit.

PROPER GROWTH MOST IMPORTANT

In preparing to supply this demand a somewhat different make up of orchard planting was necessary, from that of the larger shippers. The several extensive peach growers of the state expect to harvest the bulk of their crop within two weeks. We have found it profitable to extend the season greatly, and try to have a regular succession for at least eight weeks, but of course a much heavier production near the midseason of the crop. We soon discovered also that a large share of the labor of grading and packing could, and should be done before the fruit was picked. This work is much reduced if the fruit is all of even and fair size, good color, and free from blemishes, and in recent years we have given much more attention to having a good grade of fruit to harvest. Special stress has been laid on thinning, not only getting rid of small fruit, but having that grown of even as well as of good size. In packing we have not graded beyond two sizes, and in some varieties only one that was sent to market. We have laid great stress on having the fruit of even color, and as the market was near have allowed the fruit to ripen well. We find the matter of color fully as important as size.

SELLING TO RETAILERS

The regular Jersey basket is so well known that we have not found it advisable to use any other package. As we deliver our fruit to the retailer, no cover is used and the baskets are well filled. This basket is a very convenient one to pack, as fruit of all sizes can readily be fitted to it and made solid, and the baskets all packed equally full without spacing or breaking joints.

The great bulk of our crop has been delivered direct to the retailers, since we preferred to leave the distribution to them. We have made no special effort to sell to consumers direct, although some of this trade came of itself, and has increased, particularly at the orchard from auto calls. Parties in automobiles often came much farther than we ever carried fruit.

One method somewhat different has proved very satisfactory. One of the towns mentioned was supplied with vegetables by an extensive market gardener nearby. During the peach season he was not very busy, so he turned his attention to the sale of peaches. The price was set by the grower, being governed by that of other places, and the salesman received a set price per basket for sales. This fruit was taken at the packing house by the salesman in his own wagons. His customers being already established through the vegetables, he could and did handle a large amount of fruit continuously during nearly the whole season. There are many places where this plan or some variation of it could be carried out.

Many growers in this state, small as well as extensive ones, sell through commission houses, but others work through the retail men. One orchard firm furnishes a large retailer who agrees to handle the whole crop. The stock being largely of a fancy grade, the house has no trouble in disposing of it at good prices. The average price received by growers who deal through the retailer is certainly better than by the commission method. We have not tried shipping through parcel post as other plans seem to fill our requirements.

Considering peach marketing from all points, for southern New England at least, selling through the retailer seems to offer the best opportunity to the grower whose orchard does not exceed five thousand trees.

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF PEACHES
IN NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Trees</i>	<i>BusheIs</i>
Albany	8,737	933
Allegany	341	146
Broome	1,420	472
Cattaraugus	2,020	510
Cayuga	29,560	13,149
Chautauqua	32,377	15,486
Chemung	3,729	1,781
Chenango	24	9
Clinton	82	21
Columbia	51,818	8,411
Cortland	402	229
Delaware	89	32
Dutchess	63,741	30,132
Erie	10,987	3,858
Essex	472	19
Franklin	49	29
Fulton	48	40
Genesee	14,530	5,706
Greene	22,624	2,854
Hamilton		
Herkimer	17	13
Jefferson	331	105
Kings	4	4
Lewis	14	2
Livingston	19,251	12,767
Madison	216	66
Monroe	339,375	257,576
Montgomery	309	226
Nassau	4,015	2,201
New York		
Niagara	591,350	561,439
Oneida	103	16
Onondaga	6,409	2,933
Ontario	56,495	37,505
Orange	212,879	124,262
Orleans	157,934	140,898
Oswego	16,271	9,421
Otsego	60	19
Putnam	4,698	2,095
Queens	613	804
Rensselaer	13,353	1,387
Richmond	1,910	488
Rockland	21,081	7,034
St. Lawrence	9	11
Saratoga	1,338	14
Schenectady	729	51
Schoharie	1,574	51
Schuyler	51,993	24,706
Seneca	81,440	61,279
Steuben	8,200	3,154
Suffolk	30,333	16,096
Sullivan	3,382	1,809
Tioga	4,965	2,001
Tompkins	34,090	17,833
Ulster	313,971	196,190

<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Warren	181	.....
Washington	185	1
Wayne	166,854	130,554
Westchester	16,172	12,614
Wyoming	3,683	1,232
Yates	48,350	23,809
The State	<u>2,457,187</u>	<u>1,736,483</u>

THE CHERRY

*"How sweet is the land where the cherry trees bloom
The breezes waft hither the fragrant perfume."*

JAPANESE POEM

[1121]



MONTMORENCY

VARIETIES OF CHERRIES

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.

In New York, at least ninety per cent of the cherry trees are sour varieties. The leading commercial types in order named are Montmorency, Early Richmond, and English Morello. None of the Duke Cherries are of commercial importance, but May Duke, Late Duke, and Reine Hortense are grown in home plantations. The most popular sweet cherries in New York are Windsor, Black Tartarian, Napoleon, and Wood. Schmidt is becoming more and more popular. Two new varieties, Bing and Lambert, are being tried by many growers.

The sour varieties named meet most conditions of soil and climate and can be used fairly well, but there should be a larger number of sweet varieties grown to meet the varied requirements and diverse soil and climate conditions of New York. In discussing varieties of cherries, then, we need be concerned with but a few of the sour types and of the Dukes, but must consider a rather large number of sweet kinds.

SOUR CHERRIES

Early Richmond

Early Richmond is the leading early sour cherry. It is a splendid culinary variety and when well ripened may be eaten out of the hand with relish. Although not in as great demand for canning as Montmorency, it still makes a very good canning product, being used more than it otherwise would be to prolong the season because of its earliness. Early Richmond thrives in a great variety of soils and withstands the cold in all parts of the state except in the highest altitudes of the Adirondacks. It is indispensable in every home and commercial orchard for an early cherry.

Montmorency

Probably half the cherry trees in New York are Montmorency, and at least three-fourths of all the trees of the sour cherry are



FIG. 358.—EARLY RICHMOND
(Three-fourths natural size)

of this variety. It leads in the demands for these fruits in the markets both for the canner and for home use as a culinary cherry. It holds first place by reason of several characters, being of all the most vigorous, healthy, and productive. In the last character, particularly, it is supreme, bearing fruit year in and year out. No other cherry is adapted to so great a diversity of soil as is Montmorency, by reason of which with its further capacity to withstand heat and cold the variety is suitable to nearly every locality in the state. The fruit is fit for culinary purposes several days before it is fully ripe, a characteristic that adds to its value for the market. Because of its firm flesh and thick skin, it is less subject to brown rot than are most other varieties.

It is not a dessert fruit, but for those who like sour cherries it may be eaten out of hand with relish when fully ripe. The variety falls short only in the size of the tree which is seldom more than medium, but the head is spreading and large branched and the fruit is borne in clusters thickly scattered over the whole head so that the total yield is great. For any and all purposes it is the best sour cherry for New York.

English Morello

English Morello is the standard late sour cherry for New York. It is not a table fruit and can hardly be eaten out of hand unless thoroughly ripe. It is one of the best for culinary purposes however, having a rich dark wine color, and a pleasant, sprightly, aromatic flavor. The fruit bears harvesting and shipping well, is resistant to brown rot, and hangs long on the tree. The trees are small, round headed, and have branches with a distinct droop. To be sufficiently productive the English Morello orchard must be closely set. The trees are hardy but are not always healthy, and are not adapted to so great a diversity of soil as might be wished. The variety is not so popular now as it once was.

SWEET CHERRIES

Bing

But few sweet cherries equal Bing in size and attractiveness, and none surpass it in quality. It is, too, a very good shipping fruit. The crop hangs well on the trees and ripens at one time so



FIG. 359.—MONTMORENCY
(Three-fourths natural size)

there need be but one picking. It remains to be seen whether or not the tree will succeed in all parts of New York where sweet cherries are grown. It is certain that where the variety is happy in soil and climate, however, Bing is bound to be one of the leading commercial sweet cherries.

Black Tartarian

Black Tartarian is the favorite dooryard and roadside cherry in New York, ranking second or third among commercial sorts in the state. The characters that give it a high place in cherry culture are: first, its wide adaptability to soils and climates; secondly, the fruitfulness, healthfulness, and robustness of its trees which also bear regularly, live to an old age, and attain great size; thirdly, the variety is comparatively free from brown rot; lastly, the cherries, though not large, are tempting to the eye from their rotund form and glossy black color, and are a delight to the palate, the handsome purplish-red flesh being firm and crisp yet juicy and with a sweet, rich flavor. Unfortunately it is a little too soft to handle well in harvesting and marketing or to hold its shape as a canned product. Its small size is also against it. These defects prevent Black Tartarian from taking rank in commercial orchards, but for home plantations it is one of the best.

Coe

Coe, long known as Coe's Transparent, is the first of the light-colored sweet cherries to ripen and is a splendid fruit in quality and appearance. Its chief defect is that the fruits run small. The tree characters are very good, the trees being large, spreading, hardy, vigorous, healthy, and fruitful. Coe is worthy a place in every home plantation.

Early Purple

Early Purple, better known as Early Purple Guigne, is a valuable cherry on account of its earliness, its attractive color, and high quality. The trees are poor growers in the nursery but in the orchard take on vigor and are as healthy as those of any other sweet cherry. It requires good care and a choice cherry soil. It



FIG. 360.— ENGLISH MORELLO
(Three-fourths natural size)

is the favorite food of the robin where this, the worst of all cherry pests, abounds. No home collection should be without this variety, and it can even be profitably grown as an early cherry for local markets.

Elton

This variety is distinguished by the oblong, heart-shaped fruits which are dark red mottled with amber, very bright, clear, and glossy. Unfortunately the flesh is a little too soft to ship well but is delicate and most pleasing to the palate, the flavor being peculiarly rich and luscious. The trees are readily told by the unusual dark red color of the petioles of the leaves. The branches are stout and bear the crop thickly, placed close to the wood, and in large quantities. Brown rot attacks this variety more aggressively than it does any other sweet cherry, and for this reason Elton must remain for the most part a variety for the home orchard. The tree, too, is rather tender to cold.

Ida

Because of the beauty of the fruit, its earliness and its good tree characters, Ida is a general favorite in home orchards. It can never take a high place among commercial cherries because the fruits are soft, show bruises plainly, and are susceptible to brown rot. The trees are vigorous, hardy, and productive.

Lambert

In shape Lambert is much like one of its parents, the well-known Napoleon, but it is larger, more rotund, smoother, clearer, and brighter — one of the handsomest of the dark-colored sweet cherries. The flesh and flavor leave little to be desired; the flesh is purple-red marbled with lighter red, firm, meaty, and juicy, with a sweet, rich flavor. The tree is strong, vigorous, healthy, fruitful, and regular in bearing. The fruit sets in great loose clusters, often a dozen or more cherries to the fruit spur. The leaves are remarkably large and dark green, the foliage betokening the vigor of the variety. Lambert is well worth testing for either home or market wherever the sweet cherry can be grown.

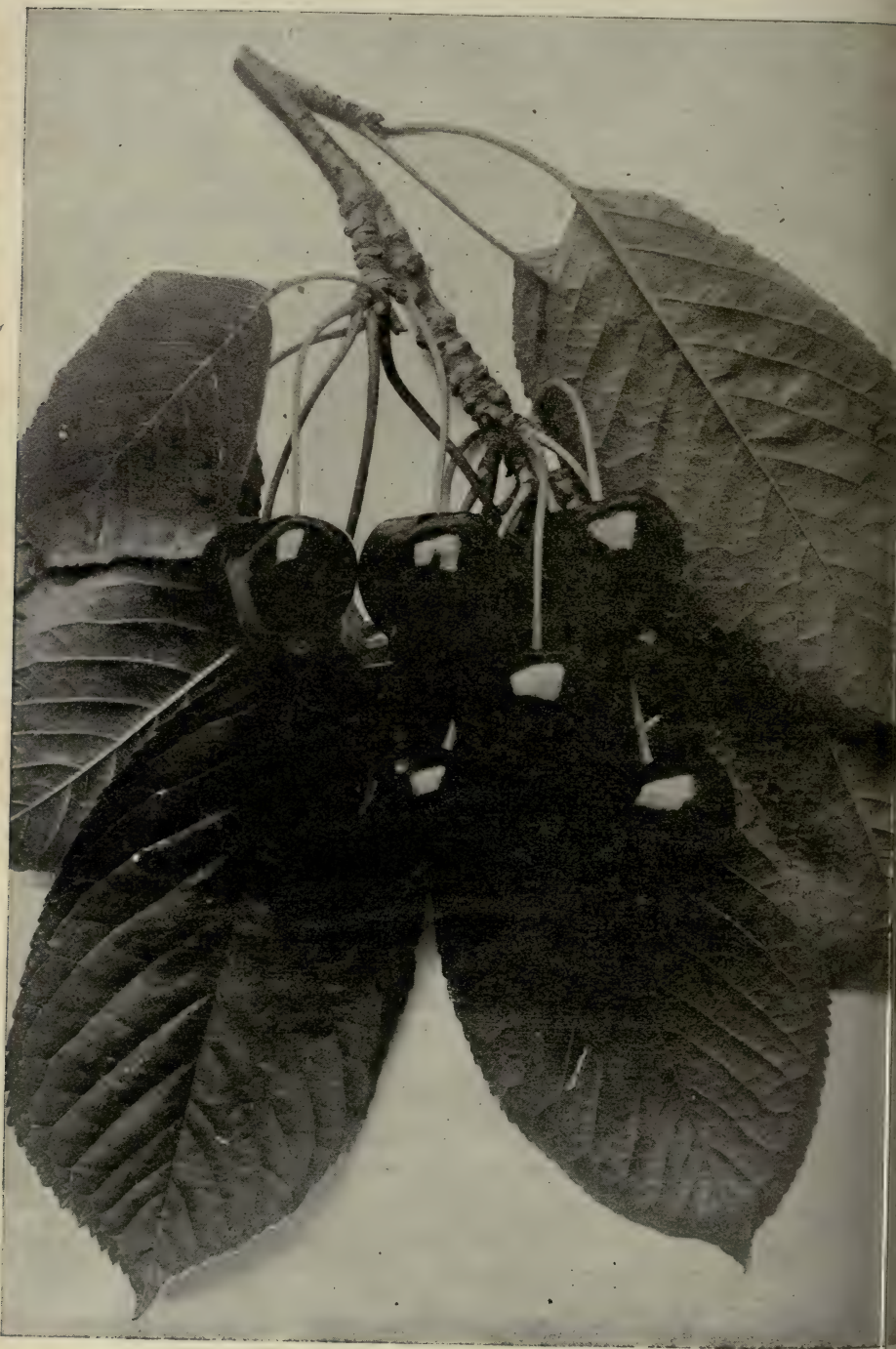


FIG. 361.—SCHMIDT
(Three-fourths natural size)

Napoleon

Napoleon is the leading sweet cherry in New York. It takes its place by virtue of its large size, handsome appearance, high quality of its fruit, and the great productiveness of its trees. The flavor is rich and sweet, with abundant juice and firm crackling flesh, making it a most delicious and refreshing cherry for dessert, and with its large size and attractive color, giving it preference over all other sweet cherries for culinary purposes. The cherries carry well and keep long. The trees are productive, come in bearing early, and are vigorous, hardy, and healthy. Unfortunately the cherries crack in wet weather and are very susceptible to brown rot. The trees, too, are fastidious to soils, thriving only in choice cherry land and in congenial cherry climates.

Schmidt

Schmidt, shortened from Schmidt's Bigarreau, hardly receives the attention in New York that it deserves. The characters that entitle it to a high place are: its large size, its round plump form, and glossy, black color; crisp, firm, juicy flesh, and sweet, rich flavor; dark ruby-red color under the skin which makes it pleasing inwardly and outwardly; freedom from brown rot; and vigorous, healthy, productive tree.

Windsor

Windsor is one of the standard hard-fleshed cherries in New York. In both fruit and trees it seems to suit cherry growers. The flesh is firm, and the product stands harvest and shipping well at a season of the year when brown rot is usually rife. The quality is good, being equalled but not surpassed by others of its class. The trees are the hardiest of the sweet cherry, and are usually fruitful. They have the faults, however, of not coming in bearing early, of being so varied in growth as to make it difficult to harvest the crop, and of bearing fruit that is too much clustered. For some reason or other Windsor is the freest of all the sweet cherries from thieving birds. We can join with all who grow this variety in recommending it as one of the best late market sorts.



FIG. 362.—WINDSOR
(Three-fourths natural size)

Wood

Wood has many qualities that fit it for the home orchard and but few to commend it for commercial plantations. The trees are tender to cold, not very productive, and somewhat fastidious to soils; they are, however, vigorous, healthy, and early in bearing. The cherries are beautiful in appearance, delicious in flavor, large, and beautiful in color, but are too soft to stand shipping, crack badly in wet weather, and are susceptible to brown rot.

Yellow Spanish

Yellow Spanish is notable for its tree characters. The trees are large and vigorous, bear abundantly and regularly, come in bearing young, and have the crop well distributed. The cherries, too, are good in most characters but run a little smaller and are more subject to attacks of brown rot than are several similar kinds. In quality Yellow Spanish is very good indeed, having tender flesh and sweet, rich flavor. It is a splendid mid-season cherry that cannot be spared in New York from either home or commercial plantations.

DUKES

Late Duke

Late Duke is a variant of the well-known May Duke, differing in ripening from two weeks to a month later. The size, color, flavor, and season of the fruit all commend it as do the vigor, health, and fruitfulness of the trees. Ripening in a season when other cherries are gone or rapidly going, Late Duke is a valuable fruit in the home orchard and for nearby markets to which tender-fleshed varieties can be shipped. Those who want late cherries can have them by planting this variety on a northern slope, against a northern wall, or in a cool soil, where a part of the crop at least will remain until August.

May Duke

May Duke is one of the oldest, and, the world over, one of the most popular cherries. It is finely flavored especially when prepared for the table, is delicious to eat out of hand, is early, may be left to hang for a month or six weeks. It thrives in greater

variations of soil and climate than do other cherries, and has trees that are as fruitful as any, being also hardy, vigorous, and healthy. May Duke fills a particular place in the cherry orchard as a fruit for home use and local markets and should be much more widely planted in New York.

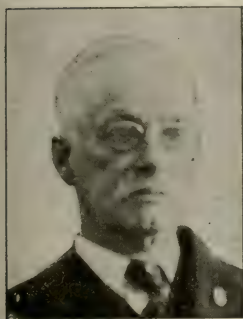
Reine Hortense

Several qualities fit Reine Hortense for both home and commercial plantations: The fruits are excellent in quality, handsome and large, and hang long to the trees. Unfortunately the fruits do not stand handling and harvesting and marketing as well as some other Dukes, and are rather too susceptible to brown rot for a good commercial cherry. The trees have several faults: They are of but medium size, are not so productive as some other Dukes, and do well only on choice cherry soils and with good care. The smallness of the trees fits the variety admirably for garden plantations of fruit.*

* See "Cherries of New York," by Professor Hedrick. Published by State Agr. Exp. Sta., Geneva, N. Y.

CULTURAL METHODS IN GROWING THE CHERRY

W. L. MCKAY, GENEVA, N. Y.



As in the case of most horticultural pursuits what any one person may have discovered from the standpoint of his experience under local conditions may not always apply to other localities, or may, possibly, even vary from the experience of other growers in the same locality. The little I may have to tell about cherry growing will be conclusions founded on the results of an experience of nearly twenty-five years at Geneva.

ADAPTATION OF VARIETIES TO MARKET

Before planting, I asked myself, as all growers must do, the two most important questions of all that confront the prospective cherry grower, "Will cherries grow in my locality?" and "What market do I wish to enter?" As I planted for the canning trade, I planted only two varieties — Montmorency and Napoleon. For this trade the Napoleon is the best sweet variety, although Yellow Spanish is also used, but Napoleon is preferred as having less color. Montmorency is, of course, the one excellent sour variety for canning, although Morello is much used also. At best, however, the Morello does not produce more than half the quantity for the same acreage that the Montmorency produces. Just at present those planting for shipment to city markets are finding that the blacks command the highest prices, while, for a local market, all the varieties named including the blacks give a good assortment.

ESSENTIALS FOR VIGOROUS GROWTH

There is a common impression that cherries may as well be planted on poorer land; this is a mistake. On the contrary let me strongly urge that the cherry orchard be given as good as

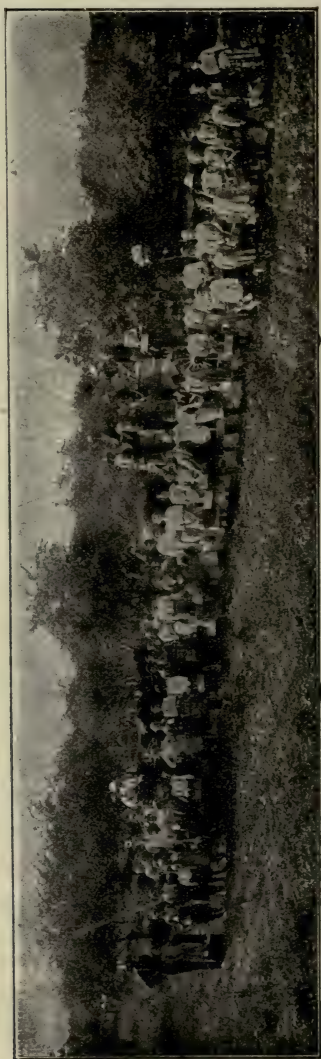


FIG. 363.—MONTMONENCY "KINDERGARTEN" OF W. L. MCKAY, GENEVA, N. Y. THESE SMALL FINGERS ANNUALLY PICK FROM FIFTEEN TO FIFTY TONS OF CHERRIES

there is on the farm. The land should be prepared by deep plowing and good fitting, as for all orchard planting. For the sour varieties in our climate I much prefer fall planting; for sweet varieties in as severe a climate as we have in New York State, probably spring planting will be best for the majority of planters, but it should be done as early in spring as possible. Planting should be so directed that the point where the tree is budded, as shown by the curve a few inches above the roots, will be an inch or two below the surface. After the ground is well settled this will bring the bud at about the surface.



FIG. 364.—A THIRSTY DAY IN THE ORCHARD

The age of the tree planted is rather unessential; I have planted one-, two-, and three-year trees successfully. The average planter will probably be better satisfied with a two-year tree, although the orchardist who has a preference for one-year-old trees is perfectly safe in using them.

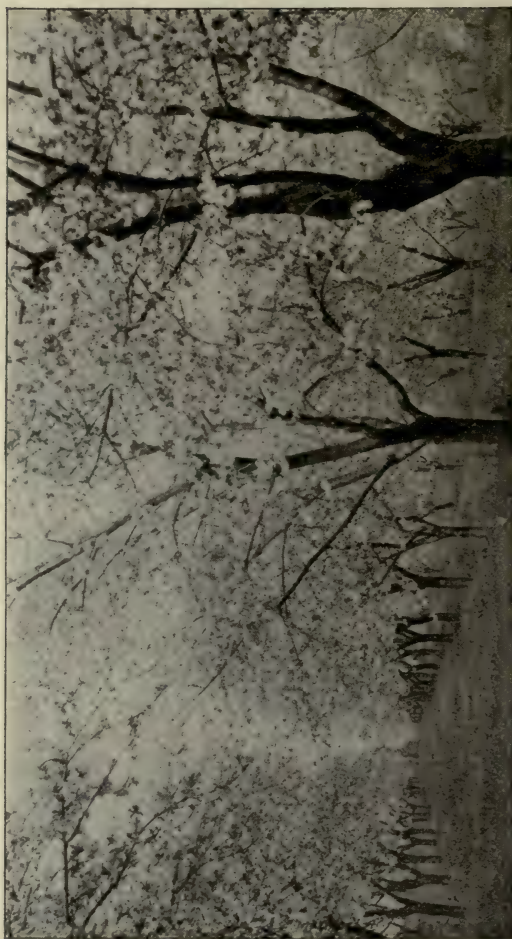


FIG. 365.—MONTMORENCY CHERRY ORCHARD IN BLOOM. FARM OF W. L. MCKAY,
GENEVA, N. Y.

The stock on which the tree is budded may or may not be essential. On my own land a Montmorency orchard that I know to be budded entirely on mahaleb stock is my best orchard. In planting on a light soil, however, general experience, I believe, goes to show that trees budded on mazzard seedlings do better, and on that possibility under most circumstances I should advise trees on mazzard if one can obtain them and wishes to pay the additional cost.

I have planted most of my Montmorency trees 14 feet apart in each direction — too close of course for the best orchard when 20 or 25 years old; but with 222 trees to the acre as against less than half that number if planted 20 by 20 feet. Planted in this manner a five-acre orchard will be worth many more thousands of dollars to the owner from the dozen or more crops it will yield before it need be opened up. When the proper time comes, by removing alternate, diagonal rows, the trees will be about 20 by 20 feet apart. In the meantime it has not cost any more to cultivate an acre of land having 222 trees than one having only 109 trees.

ESSENTIALS OF CULTURE

Drainage

In order to grow cherry trees, the land must not be wet; they cannot possibly live in wet land. If underdraining is necessary, the drains must be kept working; if they become stopped, they should be repaired at once.

Spraying

During most years the spraying of sour cherries is labor and material thrown away, but let me urge with all the emphasis at my command that the grower *keep right on throwing it away*; for about once in so many years, if spraying has not been done he will be the sorriest man in town, and will say all manner of uncomplimentary things about himself. I have usually found one thorough bordeaux spraying sufficient for Montmorency if it is applied when the fruit is about half grown, although I have sprayed when the cherries begin to show decided color, but prefer to do the work much earlier. If a second spray is given,

however, it should be applied as the fruit is commencing to color. I shall hereafter give the two sprayings. The past season, 1915, showed to a marked degree at Geneva, the necessity of the practice, for every unsprayed orchard rotted badly. One unsprayed orchard that was visited employed nearly as many sorters as pickers, while in well-sprayed orchards the labor of sorting was almost nominal. Sweet varieties are much more liable to rot, and I advise three sprayings, the first to be applied as soon as the calices have dropped. The best spraying can be given in a high wind, when the spray will sift through the trees. If there is no wind, the foliage of the sweet varieties protects the fruit from the spray much more than does that of sour varieties. The sweet varieties also require the dormant spray for scale, which the sour do not. In spraying both kinds for rot I have always preferred the bordeaux to any other spray.



FIG. 366.—THREE-YEAR MONTMORENCY ORCHARD ON FARM OF W. L. MCKAY, GENEVA, N. Y.

Cover Crops

As soon as the crop is harvested, it should be seeded to a cover crop. The one I have used most has been winter vetch, 15 to 20 pounds; cowhorn turnip, one pound; and buckwheat, about one and one-half bushels an acre. This, of course, is the most desirable, but if the land becomes heavy and hard to work, a buckwheat cover crop will soon improve the physical condition

of the soil. Probably no better cover crop can be had than that recommended by the State Experiment Station of one bushel barley or oats, preferably the former, 15 pounds of winter vetch, 12 pounds red clover, and one pound cowhorn turnip. If the grower is prevented from cover cropping, as may happen occasionally, cultivation should cease after picking, and weeds, which are much better than nothing, should be allowed to grow.

With fairly systematic cover cropping and reasonably good cultivation we have had an uninterrupted succession of thirteen heavy crops, but this of course is on heavy, strong land. We have never used commercial fertilizers, and during the period named our orchards have had only two light dressings of manure.

Cultivation

My Napoleons have always been practically in sod, being situated on both sides of a roadway through the farm, 28 feet apart, with grass eight or ten feet either side of the trees, extending



FIG. 367.—NAPOLEON ORCHARD IN BLOOM; SPRAYING APPARATUS IN FOREGROUND. FARM OF W. L. MCKAY, GENEVA, N. Y.

to the roadway on one side, and with cultivated land on the other. They have always borne satisfactory crops of large fruit when the blossoms have escaped injury from spring frosts, which has been about three quarters of the time. The trees are perfectly healthy.

With Montmorency, however, while I have myself never tried growing them in sod, my observation leads me to believe that if good-sized fruit is to be expected, and especially if the season be dry, thorough cultivation is necessary. Such cultivation should begin at least as early as the fruit is formed, and earlier if dry, and continue as late as it will be possible to drive through the orchard without damaging the fruit. More or less work should be done according to the amount of rainfall, and if the weather is dry the orchard should be cultivated as often as twice a week.

Although an advocate of thorough cultivation for cherries, it is only proper for me to state that some of the best crops of Morello I have ever seen were grown in sod on the Hammond farm, adjoining my own, several years in succession. On the same farm in 1913, a heavy crop of Montmorency with very large-sized fruit was grown without cultivation, but after a heavy cover crop of vetch had been planted. Notwithstanding these exceptions, I cannot but believe that for sour cherries at least, thorough cultivation will prove its value in average results for a term of years.

Pruning

When planting is done in the fall there should be no pruning until spring. If one-year-old trees were planted, they should not be touched except to be headed off at the proper height in case they would otherwise make too high a head. If older trees are planted, all branches not needed for the framework of the tree should be removed, and the remaining branches should not be pruned. The newly planted tree should have plenty of foliage, as much and as soon as possible. The last year's growth which is left for the framework will give more foliage if left entire, since the large, perfectly developed buds at the ends of the branches, which would be removed if pruned, are the buds that give the most luxuriant foliage in the shortest time. Further than this it is not good practice to prune cherry trees at all, except to remove dead and broken branches incident to picking, and to remove entire such other limbs as are not desired.

CHERRY INSECTS

C. R. CROSBY

Extension Professor of Entomology, Cornell University, Ithaca, N. Y.



The most important insects attacking the cherry are the plum curculio, the cherry fruit-flies, the cherry plant-louse, the pear slug, and, in the case of sweet cherries, the San José scale. In the summer of 1915 there was an unusual outbreak of the red cherry leaf beetle, an insect that normally feeds on the wild cherry and only occasionally attacks the cultivated varieties.

THE PLUM CURCULIO

Plum curculio (*Conotrachelus nemophar*) is the principal cause of knotty and wormy cherries. It is also a serious enemy of the plum, prune, peach, and apple.

The adult plum curculio is a small, rough snout beetle, about one-fifth inch in length, mottled with black, gray, and brownish (Fig. 368). On the middle of each wing cover is a black shining hump. The small, sharp jaws are situated at the tip of the snout which hangs down somewhat like the trunk of an elephant. The beetles pass the winter hidden away in stone piles, stone walls, in hedges, and under trash, in sheltered places. They come out of hibernation in the spring about the time the buds are bursting. As soon as the fruit sets, the beetles begin their destructive work. Two kinds of punctures are made: those for feeding only, and those for the reception of the egg. In feeding the beetle cuts a small round hole through the skin of the fruit and then eats out a cavity in the pulp as deep as it can reach with its snout. In egg laying

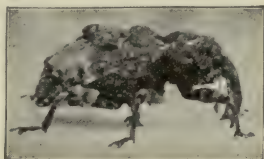


FIG. 368.—PLUM CURCULIO ADULT
(Photo by Slingerland.)

the female makes a similar puncture under the skin of the fruit, places an egg therein and then makes a semicircular cut around and under it so as to leave the egg in a flap of the flesh (Fig. 369). The egg hatches in a week or less, and the grub burrows to the stone, where it completes its growth. In the case of plums and peaches the infested fruit usually falls to the ground, but with most varieties of cherries they remain on the trees.

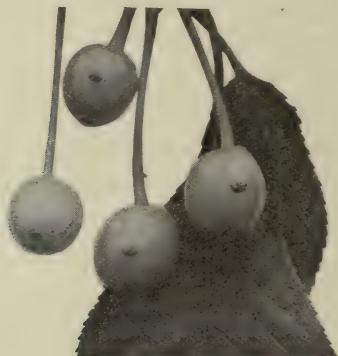


FIG. 369.—EGG-LAYING PUNCTURES OF THE PLUM CURCULIO IN CHERRIES

In about twenty days from the time the egg is laid the grub becomes full-grown, leaves the fruit, and burrows a short distance into the ground. Here in a small earthen cell the transformation to the adult takes place. In New York the majority of the curculios are in the ground between July 10 and August 10. They are then in a delicate, helpless condition, and are almost certain to perish if their cells are broken open. The beetles emerge from the ground during August and early September, and, after feeding for some time on the fruit, go into hibernation. There is only one generation annually.

Control

The plum curculio is always most abundant where good hibernating quarters are available. The first step in the control of this insect consists in reducing to a minimum such shelter by clearing away all stone piles, stone walls, hedges, and similar hiding places. After such conditions have been remedied, it is not difficult to control the curculio on cherries by spraying. Good results have been obtained by using arsenate of lead, two and one-half pounds in 50 gallons of lime-sulphur (32 degrees Baumé), at the rate of 1 gallon in 75 gallons of water. Two applications should be made, the first soon after the petals fall, and the second a week or ten days later.

CHERRY FRUIT-FLIES

Cherries, especially the late varieties, are liable to be infested with the maggots of two species of spotted winged flies (*Rhagoletis dingulata* and *Rhagolitis fausta*), as shown in Fig. 370. These maggots are smaller and less curved than the grub of the plum curculio. The parent flies appear on the trees some time in June but do not begin to lay eggs until about two weeks later. The female inserts the egg in a puncture through the skin of the fruit. The maggot burrows through the flesh, causing decay to set in as soon as the cherry begins to ripen. As the maggot becomes larger, breathing holes are made through the skin of the fruit. Cherries infested by fruit-fly maggots have a characteristic appearance; as decay advances portions of the surface become sunken as shown in Fig. 371. The maggots become full-grown with the ripening of the cherry, leave the fruit, and, just beneath the surface of the ground, transform into puparia which somewhat resemble grains of wheat. In this condition the insect passes the winter. There is only one brood a year.



FIG. 370.—CHERRY FRUIT-FLY RESTING ON FRUIT
(Photo by Illingworth.)

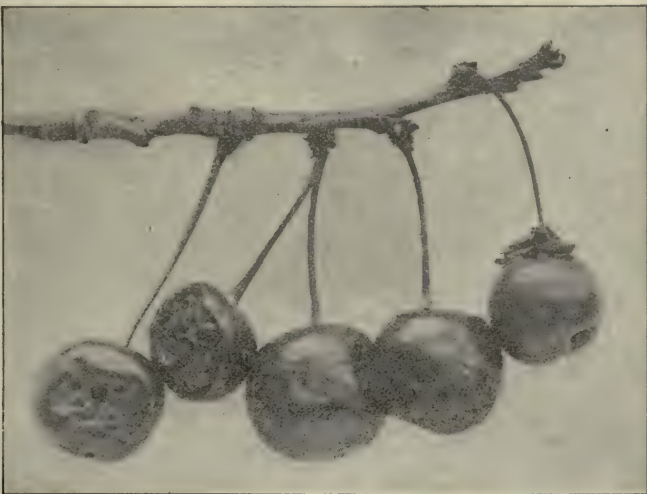


FIG. 371.—INFESTED CHERRIES AT ABOUT THE TIME THE LARVAE LEAVE THEM

Control

Cherries may be protected from maggot injury by killing the parent flies with a sweetened poisoned spray before they have deposited their eggs. The poison should be applied at the first appearance of the flies and should be repeated weekly, or after each rain, since the poison is easily washed off. This treatment should be continued until no more flies are found on the trees. Good results in killing the flies have been obtained by using the following mixture: arsenate of lead, 3 ounces; molasses, 1 pint; water, 4 gallons.

It is not necessary to use a large quantity of this mixture, or to make a thorough application — one pint is sufficient for a tree of moderate size. The liquid should be sprinkled over the tree in rather large drops; a small garden syringe, holding about a pint, will be found convenient for the purpose.



FIG. 372.—CHERRY LEAVES CURLED BY
APHIS

(Photo by Matheson.)

THE CHERRY PLANT-LOUSE

This blackish plant-louse (*Myzus cerasi*) is a serious enemy of both sour and sweet cherries, but is more injurious to the latter. The winter is passed in the egg stage. The black, shining eggs are

attached to the bark of the smaller branches, generally near the buds. They hatch just as the buds are opening, and the young lice cluster on the opening buds. These lice are all females and reproduce without being fertilized. They multiply with wonderful rapidity, so that within a few weeks the undersides of the leaves and the tip of the branches are thickly covered with them. The leaves become curled, the branches stunted, the fruit remains small and may fall prematurely (Fig. 372.).

Control

The cherry plant-louse can be controlled by very thorough spraying with "Black Leaf 40" tobacco extract, 1 pint to 100 gallons of water in which 5 pounds of soap has been dissolved. At least 10 gallons of this mixture should be applied to a tree of moderate size. The application should be made while the lice are clustered on the opening buds. They are then relatively few in number and are exposed so that they can easily be hit with the spray. After the lice have curled the leaves it is very difficult to reach them. To be successful the work should be done at the right time and with thoroughness.

THE PEAR SLUG

The pear slug (*Eriocampoides limacina*) is also a serious enemy of the cherry. The injury is most severe on trees recently planted; the slugs may destroy the foliage of such trees before they become fully established, with the result that a large proportion are killed.

The pear slug passes the winter in the larval stage in earthen cocoons two or three inches below the surface of the ground. The transformation to the adult takes place in the spring, and the glossy black, four-winged flies appear on the trees about the middle of May. The female is provided with a sharp saw-edged ovipositor by means of which she inserts her eggs in a blisterlike cavity between the two layers of the leaf. The egg hatches in about two weeks, and the larva escapes through a cut on the upper surface of the leaf. The larvae soon become covered with a sticky slime, which is retained until they are full-grown and which gives them the appearance of small snails. In form they somewhat resemble

a tadpole. They feed on the upper surface of the leaf, eating only the epidermis and leaving the skeleton of veins and the lower epidermis to turn brown and wither. In severe cases the tree is defoliated and the crop fails to mature. A second brood of the flies appear in late July and early August and lay eggs for another brood of slugs.

Control

The pear slug is readily controlled by spraying the trees with arsenate of lead, 4 pounds in 100 gallons of water. The application should be made about the time the eggs are hatching.

SAN JOSÉ SCALE

While the sour cherry is nearly immune to the San José scale (*Aspidiotus perniciosus*), the sweet varieties often become badly

infested. The treatment for scale on sweet cherries is the same as that commonly practiced for its control on other orchard trees. Good results may be obtained by thorough spraying with lime-sulphur (32 degrees Baumé), 1 gallon in 8 gallons of water.



FIG. 373.—LEAVES RIDDLED BY
RED CHERRY LEAF-BEETLE
(Photo by Matheson.)

THE RED CHERRY LEAF-BEETLE

From time to time since 1894 local outbreaks of this brick-red leaf-beetle (*Galerucella cavicollis*) have occurred in the northern states from Michigan to New Hampshire. In May and early June of 1915 the beetles were found in great numbers on their food-plant, the wild red cherry

(*Prunus pennsylvanica*), in southwestern New York. About the same time they swarmed in great numbers into the peach, plum,

and cherry orchards in the western and southwestern part of the state, and in many cases caused considerable injury by riddling the leaves.



FIG. 374.—RED CHERRY LEAF-BEETLE
(Drawing by S. C. Bishop.)

The beetle is about one-fifth inch in length and is brick-red in color with black legs and antennae (Fig. 374). Although the larvae have been found on the leaves of the cultivated cherry, most of the young develop on the wild red cherry. The beetles deposit their oval, pale-yellow eggs in June and July. The eggs hatch in ten days or more, and the larvae skeletonize the leaves, only the larger veins being left. The full-grown larva is about one-fifth inch in length and blackish in color. The new crop of beetles appears in late summer, and, after feeding a short time on the leaves, they go into hibernation, where they remain until the latter part of the following May. There is only one generation annually.

Control

The red cherry leaf beetle may be poisoned by spraying the trees with arsenate of lead, 2 pounds in 50 gallons of water. The application should be made at the first appearance of the beetles.

DISEASES OF THE CHERRY

LEX R. HESLER

Assistant Professor of Plant Pathology, Cornell University, Ithaca, N. Y.

Powdery mildew, caused by *Podosphaera oxycanthae* (De C.) De Bary, is found on other plants besides the cherry, such as the apple, pear, quince, plum, hawthorn, blueberry, and persimmon. It is in the nurseries of New York State that destruction runs high, although orchard cherries are often seriously affected. Budded sour cherry stock is said to be the most severely attacked, and yet sweet cherry varieties and mazzard stocks are often troubled. Mildew is usually most prevalent following a period of heavy rainfall.



FIG. 375.— POWDERY MILDEW ON SOUR CHERRY TWIGS AND LEAVES; HEALTHY TWIG AT LEFT AND DISEASED TWIG AT RIGHT

Affected trees are generally recognized by an upward rolling of the foliage; the young shoots and branch tips are also affected (Fig. 375). On the lower surface of the leaves may be seen a tangle of white, feltlike threads of the fungus. With the early development of the white, feltlike mass, stalks are projected into the air; these bear the summer spores, which are produced in great numbers and which spread the mildew parasite throughout the summer. By midsummer small black specks may be observed scattered over the felty mass. These specks are the fruiting

bodies of the fungus and the organs by which the fungus hibernates. In spring or early summer, winter spores, which were developed the preceding fall, are discharged and initiate the first infection. Summer spores are soon developed, and new infections follow.

Good control has been obtained by the use of lime-sulphur solution diluted 1 to 50. The addition of three pounds of iron sulphate to 50 gallons of the mixture is said to have a tendency to reduce possible injury to the foliage and also to increase the adhesiveness of the mixture. The first application should be made as soon as the disease appears, the frequency of succeeding applications depending on the prevalence of the disease, which is largely determined by weather conditions. Shot-hole, or leaf spot, and powdery mildew may be controlled by one schedule of spraying.

For brown rot and leaf spot, see discussion under plum diseases, pages 1192 and 1195.

MARKETING CHERRIES

C. K. SCOON, GENEVA, N. Y.



"Study the demand of your market" is as good a rule in deciding what varieties of cherries to plant as it is in buying dry goods or shoes. The canners do not, as a general thing, buy the red, sweet cherries: they pay a good price for white ones. On account of their susceptibility to rot during rainy, hot weather at ripening period, however, they are not in as high favor with growers as the hard-fleshed red varieties. Among these,

Windsor and Schmidt's are probably the best in size and good-shipping qualities. They ripen just before the sour varieties, and so extend the season for picking and marketing, enabling the grower to arrange for the same help and give continuous employment.

THREE DESIRABLE VARIETIES

The three principal varieties of sour cherries are Early Richmond, Montmorency, and English Morello, named in the order of ripening. Early Richmond is not the equal of the other two in that it is smaller, has a large pit, and thin, watery flesh; but it comes at a season when no other sour cherry is in market and has considerable demand on that account. Montmorency is the popular cherry. More tons of this than of all other varieties combined are put on all markets and the canners use it almost exclusively.

INCREASED PLANTINGS CALL FOR NEW MARKETS

Until the last two or three years the canning factories were able to use all the sour cherries offered for sale, but the plantings have been so largely increased in recent years that new markets must be found and the general use extended. This seems to be the condition of all kinds of fruit at the present time; and

whether the public can be educated to use all that will be produced is a problem for the future that will call for an entirely new type of business ability than that which has been put into this end of the fruit industry heretofore.



FIG. 376.—PICKING MONTMORENCY CHERRIES
IN ORCHARD OF W. L. MCKAY, GENEVA,
N. Y.

That the consumption of cherries can be greatly extended, the following incidents will show:

A well-known fruit grower who had a young orchard coming into bearing near a large city in Massachusetts went to a grocer and asked whether he could sell some sour cherries. The grocer said he never had, but would try a few in quart berry baskets. Customers tasted of these and exclaimed, "Why, they are sour!" The grocer persuaded them to try a few for home use, however, and the orders soon increased to a considerable trade.

In another case an auto party stopped by the roadside where a fruit grower was picking cherries, and wanted to buy a basketful to eat. The people came from a section of another state where no cherries were raised, and within a few days the grower received an order for six baskets for family use. When the fruit arrived their neighbors wanted some, and a much larger order was sent accompanied by the cash. This trade has increased from year to year, until a large proportion of the crop is disposed of in this manner. The grower has charged a fair price but much less than his customers would have to pay at the store. He has continued to send his customers good fruit carefully packed and has opened up an entirely new market. It is easy to see how much a convenient package, with the grower's name and address plainly stamped on the cover, the name of the variety and a bright-colored picture of the fruit, together with a few brief directions for cooking and canning, will aid in extending this kind of market.



FIG. 377.—PICKING AND PACKING CHERRIES IN ORCHARD OF W. L. MCKAY, GENEVA, N. Y.

PACKAGES AND HARVESTING

Some grocery trade demands cherries, even the sour varieties, put up the same as berries in quart baskets packed in crates or carriers. For most markets, however, the six-pound basket with a good handle is the most convenient package. If the fruit is carefully packed with stems on, it can be shipped in iced cars

and sent by freight as long distances as plums or peaches. Like other fruits, cherries will "stand up" much longer when grown in a dry season than in a wet one. In a rainy season, picking should begin three or four days earlier in the ripening process than is safe to wait in dry weather. The period that may be counted on for picking sweet cherries is about one week and for sour ones, two weeks. In large commercial orchards the usual method is to begin picking as soon as the fruit is ripe enough to be all taken from the trees, making but one picking, although it may be necessary to leave some in the center of the trees during the first two or three days. This, however, increases the cost of harvesting, as it is expensive to go over the trees a second time moving ladders and baskets.



FIG. 378.—LOADING CHERRIES FOR CANNING FACTORY

HELPERS FOR HARVESTING

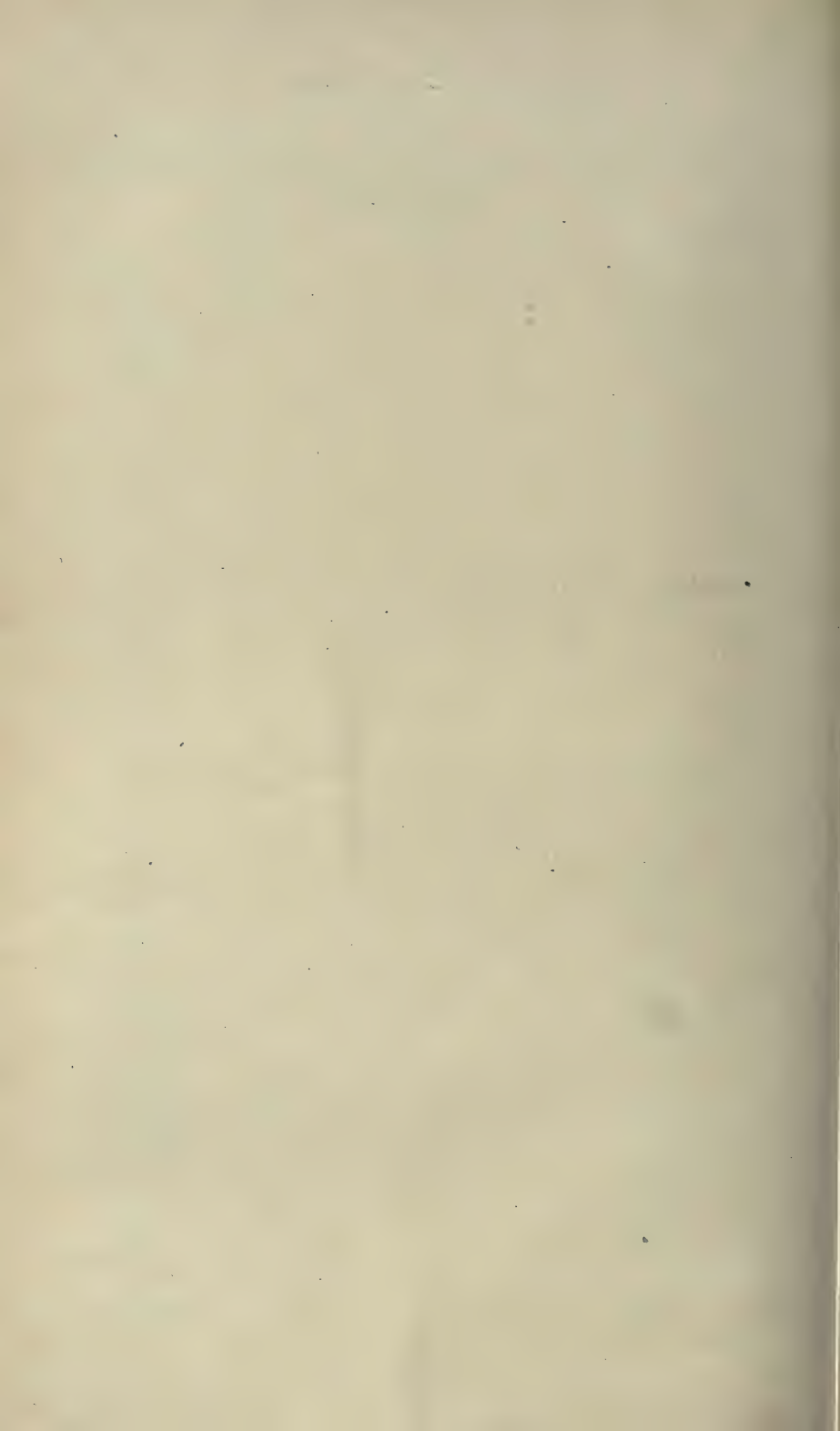
For the smaller orchards the help employed consists of women and children from nearby towns, but where large numbers are required, Italians or other foreigners are brought from the cities and housed in the orchards. The great advantage of this plan is that it is not necessary to furnish teams to carry the helpers daily to and from the orchard, and they are on hand to work during that part of the day which has been broken into by rain, even though it be only for an hour or two at the close of the day. This precious time would be lost if day helpers were employed.

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF CHERRIES
IN NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Albany	12,355	4,378
Allegany	6,019	985
Broome	11,094	3,054
Cattaraugus	8,464	1,379
Cayuga	14,390	5,558
Chautauqua	24,483	12,630
Chemung	7,219	1,983
Chenango	3,603	1,000
Clinton	3,810	140
Columbia	78,526	25,002
Cortland	8,197	1,629
Delaware	5,759	1,653
Dutchess	7,097	3,474
Erie	29,483	10,534
Essex	4,273	344
Franklin	376	30
Fulton	736	112
Genesee	11,070	3,758
Greene	9,927	2,962
Hamilton	3	
Herkimer	2,581	805
Jefferson	4,631	1,571
Kings		
Lewis	325	50
Livingston	7,941	3,183
Madison	7,105	1,632
Monroe	49,831	28,187
Montgomery	5,561	1,447
Nassau	487	287
New York	4	
Niagara	61,786	29,011
Oneida	5,885	1,447
Onondaga	25,932	8,593
Ontario	36,394	28,374
Orange	7,863	3,635
Orleans	14,682	8,979
Oswego	3,508	3,461
Otsego	4,021	1,037
Putnam	2,147	505
Queens	75	82
Rensselaer	9,528	3,681
Richmond	63	44
Rockland	3,398	1,596
St. Lawrence	989	154
Saratoga	13,187	2,866
Schenectady	6,368	2,004
Schoharie	6,186	1,280
Schuyler	6,525	3,705
Seneca	27,063	8,952
Steuben	15,412	3,802
Suffolk	2,657	852
Sullivan	1,730	399
Tioga	7,279	2,031
Tompkins	10,847	3,700
Ulster	11,005	6,353

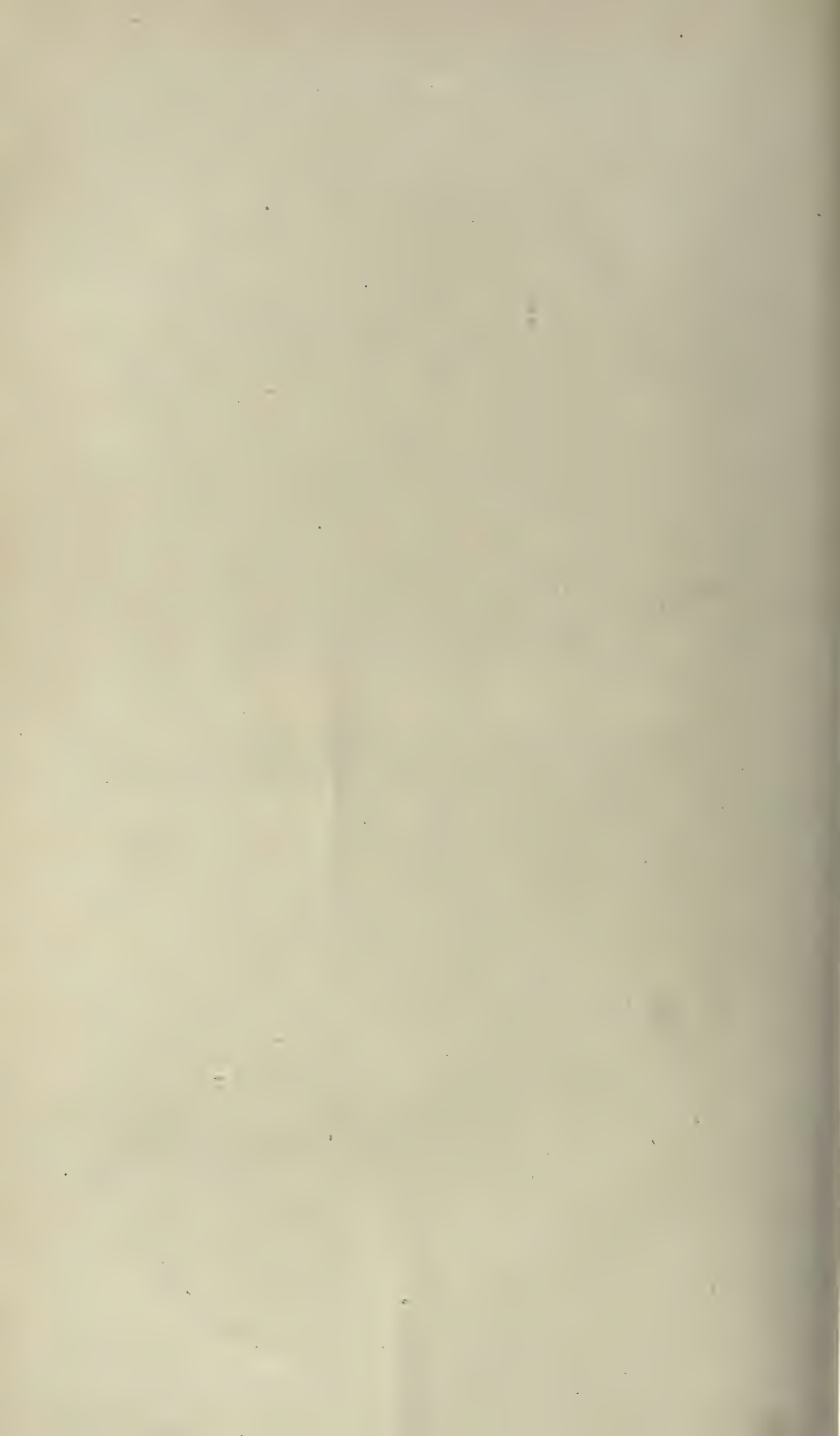
<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Warren	2,578	389
Washington	7,626	1,643
Wayne	35,385	18,304
Westchester	2,384	956
Wyoming	6,134	1,631
Yates	10,002	4,364
The State	<u>673,989</u>	<u>271,597</u>



THE PLUM AND PRUNE

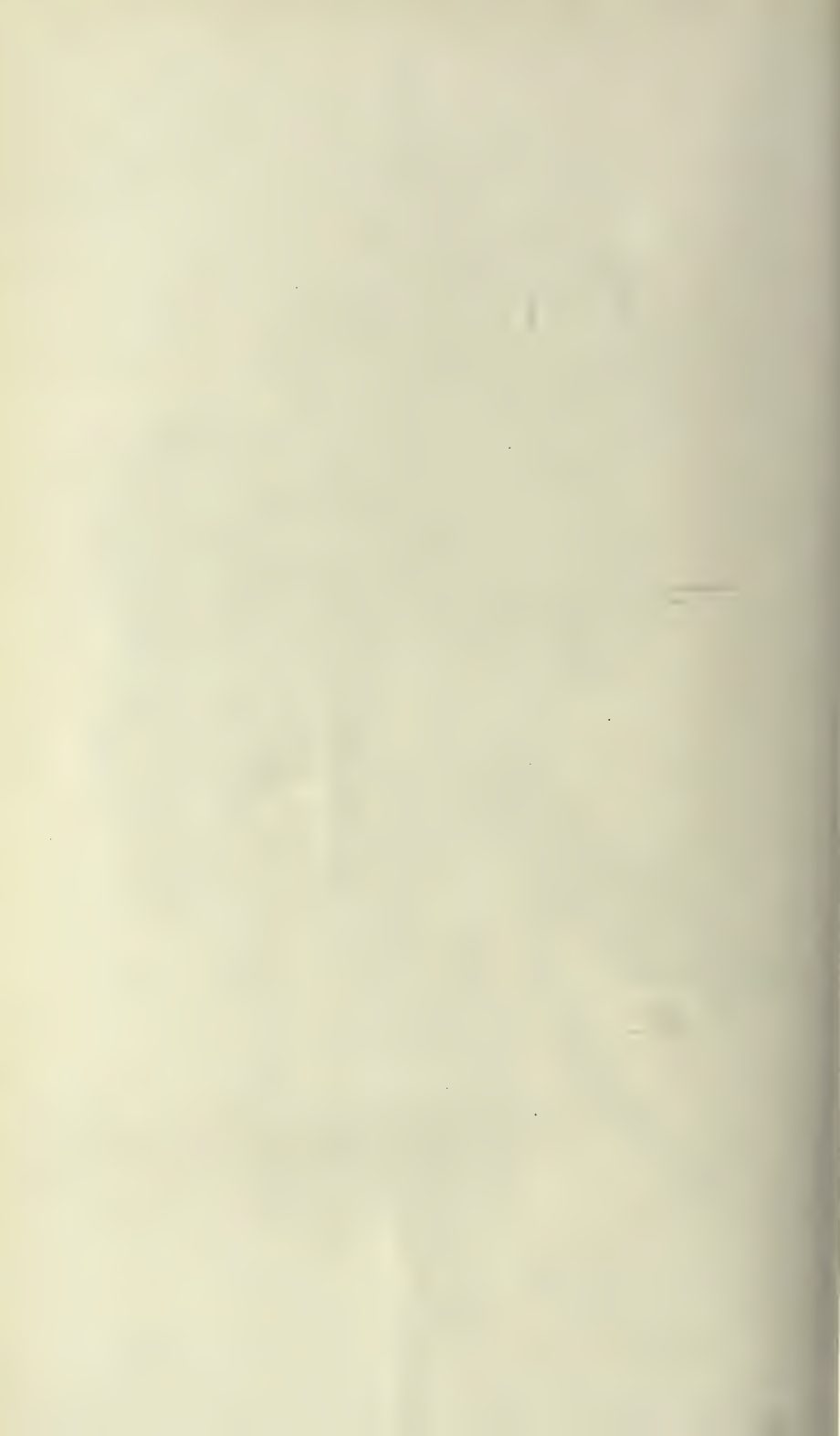
"As a domestic fruit the plum stands very high, not only for dessert, but for cooking and canning. A few trees can be crowded into corners where other fruit trees would not find room or would become the prey of insects. In city yards the plum is an ideal fruit tree."

E. P. POWELL





FRENCH DAMSON



VARIETIES OF PLUMS

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.

The following, in the order named, are the leading commercial varieties of plums in New York: Bradshaw, including the Niagara which is identical, Reine Claude, Italian Prune, German Prune, Lombard, Shropshire Damson, Grand Duke, Washington, and Gueii. Two Japanese varieties, Abundance and Burbank, are as widely distributed as any, but these are seldom grown extensively in commercial plantations, and their popularity is on the wane. Varieties of native plums are seldom grown in New York, although now and then they are found in home collections and in a few small commercial plantations. Wild Goose is more often planted than any other native plum.

The fruit of the Japanese and native plums is so inferior to that of the *Domestica*, or European type, for both market and domestic purposes that varieties of these are not likely to take the place of European plums. Neither the Japanese nor the native plums can be said, now, to be on probation, for they have been grown long enough so that both grower and consumer are familiar with them. In the case of the Japanese sorts at least, the varieties have been greatly overpraised and they are suffering from the reaction. We have, then, in the following description, to deal chiefly with varieties of the European, or *Domestica*, plum.

ABUNDANCE

Abundance is the best of the Japanese plums. Two assets that have given the variety its great popularity are adaptability to a wide diversity of soils and climates and, as its name implies, an abundance of fruit. It bears heavily and yearly. As a market plum, Abundance has several faults. It cannot be shipped well and neither does it keep; it is much subject to brown rot and matures unevenly. The fruit of this variety should be picked before it is quite ripe, as it develops its flavor best when so picked and the rot and the dropping are thus avoided to some extent.



ARCH DUKE

Arch Duke is one of the leading purple market plums in New York. The qualities that make for it a high place among commercial varieties are: large size, handsome color, and firmness of flesh and skin so that it both keeps and ships well. Arch Duke compared with Grand Duke, which is known by all plum growers, is nearly as large, has a thicker neck, the same color, a heavier bloom, higher quality, firmer flesh, is stone free, and ripens earlier. This variety is suitable for both home and market use.

BAVAY

Bavay is one of the best of the green plums. It is unexcelled for dessert, and it retains its delicious flavor when cooked, making a rather rare combination of a first-rate dessert and a first-rate culinary fruit. It is a good market plum for it both keeps and ships well. The trees bear young, annually, and heavily, and while not so hardy, so large, so robust, or so long-lived as could be wished, yet in these respects they are superior to most other green plums. Bavay is indispensable in home orchards and can be recommended for much more general planting in commercial plantations.

BRADSHAW

Bradshaw leads all other plums in number of trees in New York, but its great popularity is hardly justified. The trees grow slowly and are tardy in coming in bearing; the fruit is not especially high in quality, and in many regions is attacked by brown rot too freely. To offset these faults, the trees are large and well formed, bear regularly and heavily, are hardy, robust, and healthy, and the plums are large and handsome and ship well. The variety, too, is seldom badly attacked by San José scale. The value of the crop is greatly lessened in New York because it ripens in the midst of the peach season. It should be planted only for commercial plantations.

BURBANK

Burbank is the chief rival of Abundance among Japanese plums in New York. The fruit of Burbank is of better quality, is handsomer, keeps and ships better, and is less susceptible to brown rot. The fruit ripens a week later than Abundance, which in most seasons is an advantage. The trees of Burbank are dis-

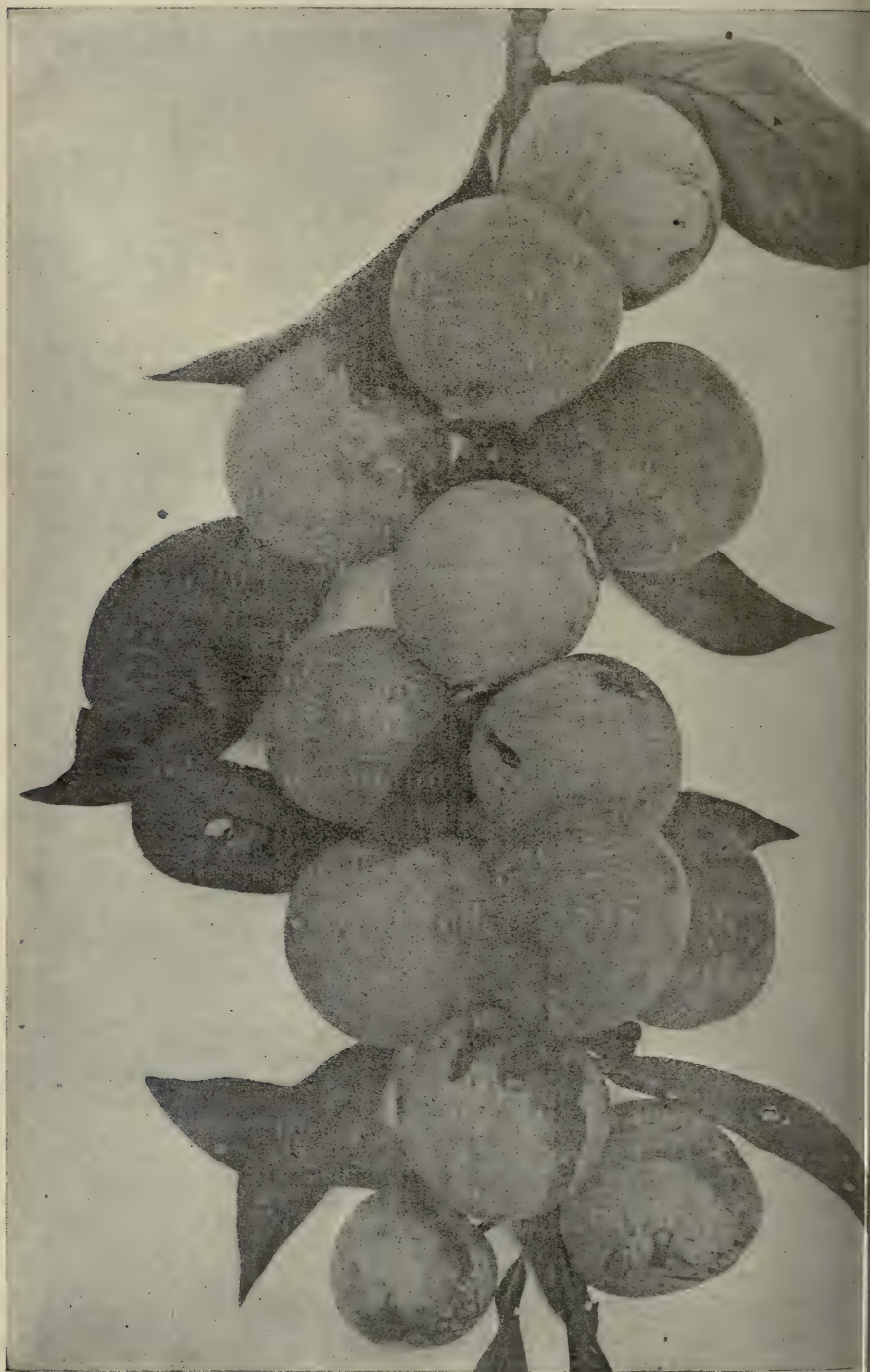


FIG. 380.—THE BURBANK

tinguished from all other plums by their low, spreading habit, flat top, and drooping branches. The wood is brittle — a rious defect. In common with other Japanese sorts, Burbank is less troubled with curculio and black knot than are the European plums. The fruit should be picked before fully mature if it is to be kept or shipped. The fruit of the trees should always be thinned.

DIAMOND

Diamond is a large, handsome, well-formed purple plum but is coarse in flesh and not at all pleasantly flavored. The firm flesh and tough skin of the variety commend it as a market plum, and the trees are large in size, vigorous, hardy, and productive. It is planted largely for the markets where it sells because of its fine appearance.

DUANE

Duane is a popular plum because of its large size, well-turned shape, beautiful purple color, and firm, golden flesh. Appearance however, is the only asset of the fruit, for the flesh is dry, tough, sour, and clings to the stone. It is desirable only for culinary purposes. The trees excel in size, vigor, and productiveness, and are usually hardy and bear their crops well distributed. Duane is generally found to be a profitable market sort.

FRENCH

French is the largest of the Damsons, so large, indeed, as to lead to the belief that it is a hybrid with some *Domestica* plum, the size of the trees, blossoms, and foliage also leading to such a supposition. This excellent Damson is largely grown for the market in western New York. Good quality as well as size and appearance aid in selling the fruit. The fruit have but one defect in that the pit is large for the amount of flesh. The trees are hardy, bear abundantly and annually, and carry their foliage so well that fruit and wood usually ripen perfectly even when the trees are not sprayed. The season is a little later than that of the more commonly grown Shropshire.

GERMAN PRUNE

German Prune is characterized by the large, hardy, vigorous, healthy, productive trees, characters so marked that one can say at

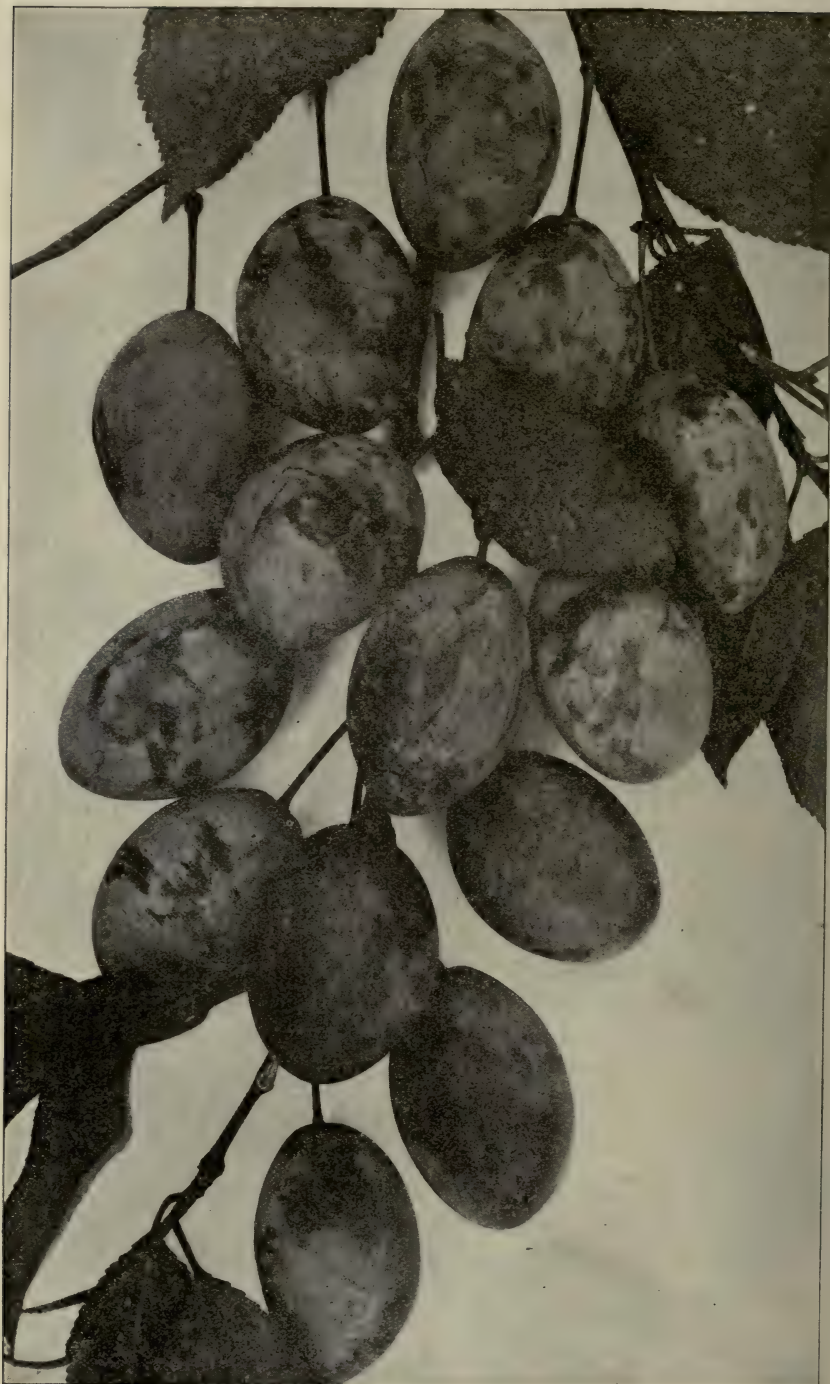


FIG. 381.— THE GERMAN PRUNE

once that it is the tree that gives this plum its great value. The fruit is excellent for all culinary purposes and especially so for canning. The chief objection to the plum is that the fruits run small. They are also rather too tart for dessert fruits.

GRAND DUKE

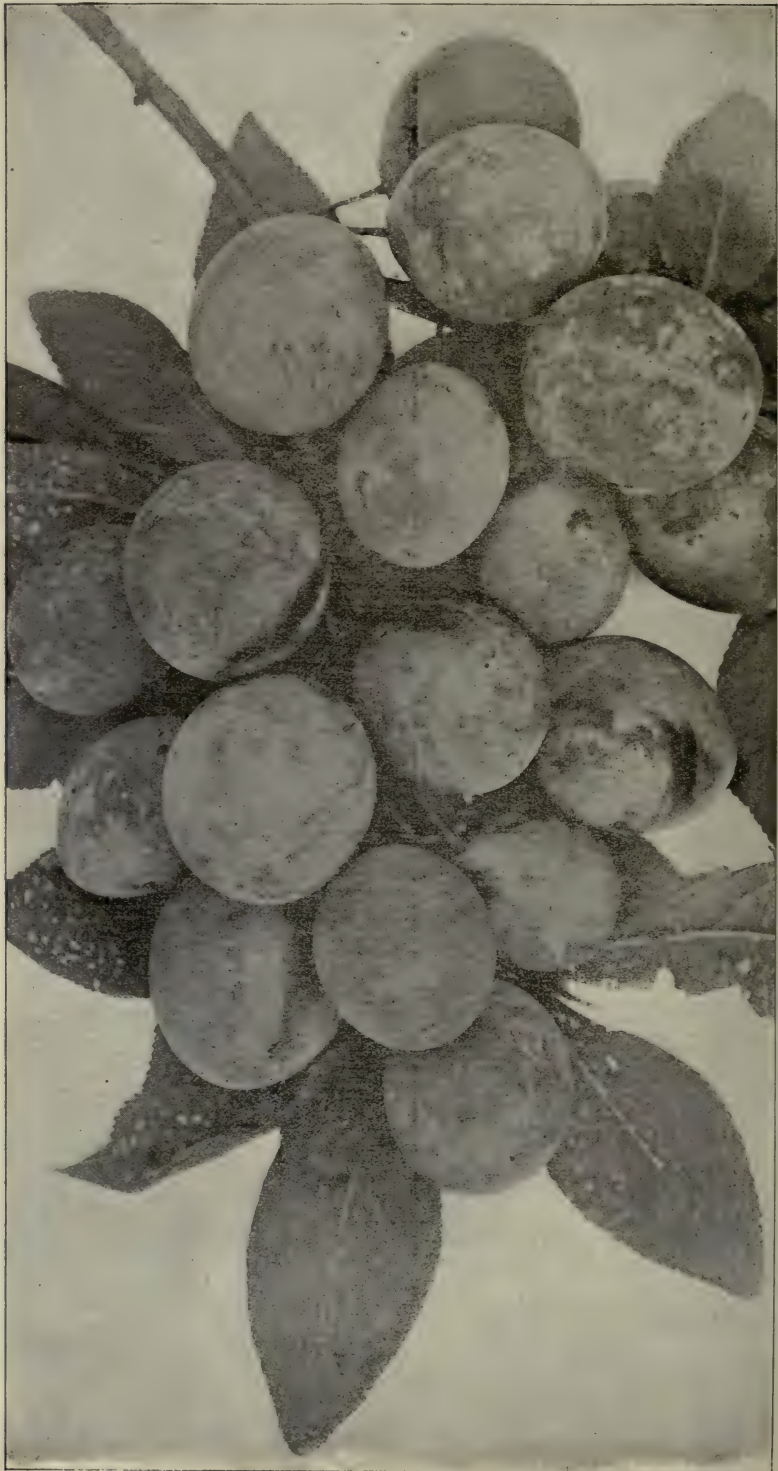
Grand Duke is the favorite late shipping plum in New York. Its great popularity is due to its large size, pleasing shape, handsome plum-purple color and its firm meaty flesh that fits the variety for shipping. The flavor is not pleasant, and the plum is no more than a second-rate dessert fruit although it is very good in whatever way cooked. The trees are seldom large and vigorous enough to be called first-class although usually hardy; they come in bearing slowly but bear regularly and abundantly and hold the crops well. The plums are usually free from rot and remain in good condition a long time. Grand Duke deserves its popularity as a market plum in this state. .

GUEII

Gueii is one of the standard plums of its season in New York, many growers holding that it is the best general purpose plum of all the Domesticas. This popularity is due to its being a money-maker, as few would care to grow it for home consumption. The quality of the fruit is poor, and it cannot be called a particularly good-looking plum, but the variety bears early and abundantly; the trees are large and vigorous, healthy and hardy, and the plums are hardly surpassed for shipping, especially at the time at which the crop comes on the market, about midseason, the best shipping plums maturing a little later. The fruit is frequently subject to brown rot. Its color is a dark purple-black overspread with thick bloom.

ITALIAN PRUNE

Italian Prune is one of the most widely grown of all plums not only in New York but the world over. Several qualities make it popular. It is finely flavored whether eaten out of hand or in whatever way prepared for the table; it keeps and ships well; it is a handsome plum-purple in color; the trees are large, hardy, productive, and well formed, and bear regularly. Unfortunately, the trees are capricious as to soils and climates, do not always bear



well, and are susceptible to diseases and suffer from dry or hot weather. In locations to which it is suited, however, this prune must long remain one of the leading plums.

LOMBARD

Of all plums, Lombard adapts itself most widely to soils and climates; the trees are robust, healthy, productive, and regular in bearing; their fruits are comparatively free from plum curculio; lastly, the plums are showy, and therefore readily salable. The tree characters of Lombard are all good. The variety would be preeminently the plum for the millions, were it not for a fatal fault — it is very poor in quality. Canned, cooked, or spiced it does very well, but as a dessert fruit it is all but worthless. Lombard is now much used in the canneries of New York and is also planted largely in home orchards where only hardy plums will stand the climate. In the markets it is usually a low-priced plum.

MONARCH

The nicely turned form and the rich purple color of Monarch make this a most handsome fruit. While the quality is not of the best, yet the variety ranks high among the purple plums for dessert, few plums of this color being especially palatable to eat out of hand. The variety is not remarkable for any of its tree characters yet averages well with other plums and, with those of the fruit, make a variety above the average and give it a place among the best sorts for New York.

POND

Pond is preeminent among plums for its large size. It is distinguished also by its form and its color, both being pleasing as well as distinctive. At one time Pond was very largely grown in New York, but the fruits are not so perfect grown here as on the Pacific Coast, and the trees are not regular in bearing. The eye is pleased with the Pond, but the palate is sadly disappointed; at its best it is not even second-rate. The fruits, however, ship and keep well, and it is the leading red plum found in our markets. It is doubtful, however, whether its culture ought to be recommended on a large scale in New York since it comes in such quantities from the Pacific Coast.

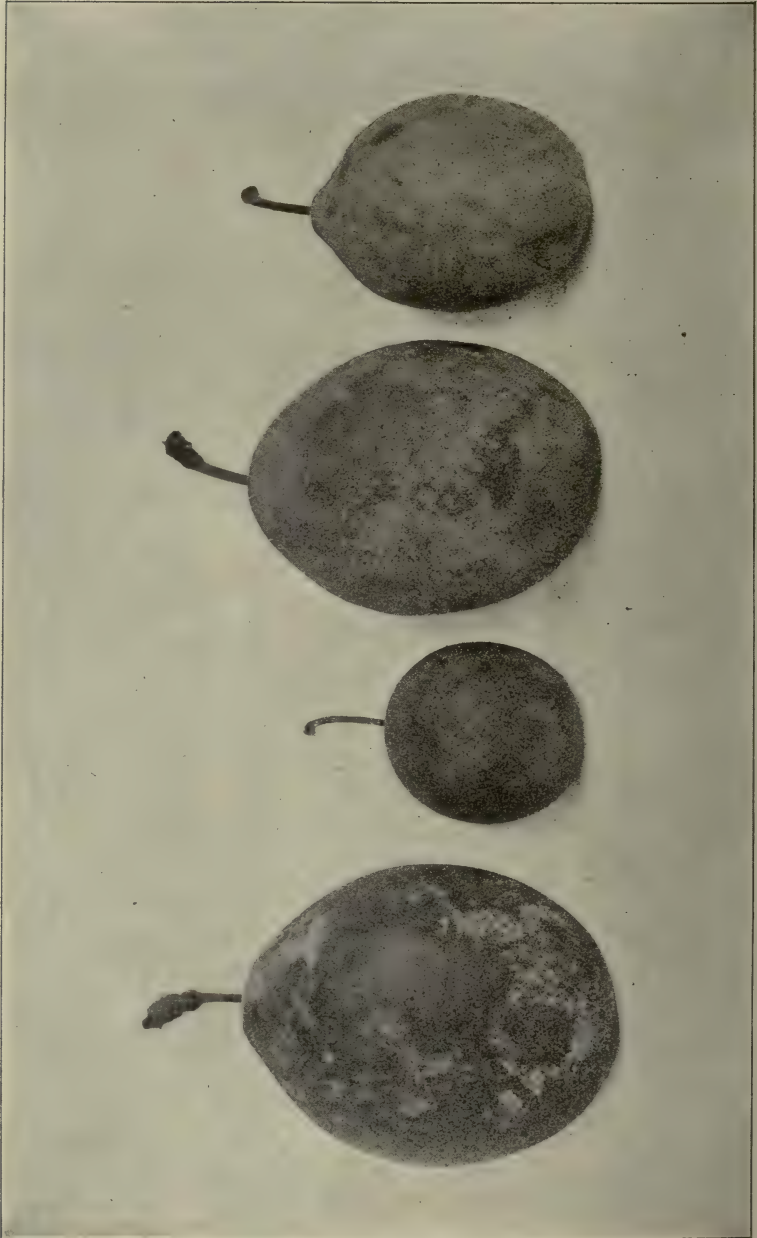


FIG. 383.— FROM LEFT TO RIGHT: POND, FRENCH DAMSON, YELLOW EGG, ITALIAN PRUNE

QUACKENBOSS

Although not a leading variety, Quackenboss is prominent when making a list of the commercial plums of New York. To a high degree its fruits possess characters that make a good market plum; they are of large size, of handsome plum-purple color; the flesh is tender and juicy with a sweet, pleasant flavor, making it one of the good purple plums. The tree is large, vigorous, and hardy, with a round, spreading top. The variety does not have the reputation of being fruitful and fails chiefly as a commercial sort for this reason. It is a late-maturing plum and comes on the market at a time when this fruit is wanted for home canning, the demand for this purpose helping greatly in its sale.

REINE CLAUDE

For the qualities that gratify the sense of taste — richness of flavor, consistency in texture of flesh, abundance of juice, and pleasant aroma — Reine Claude is unsurpassed. The fruits are not remarkably handsome, but when they are grown on thrifty trees, the crop thinned, foliage and fruit kept free from pests, the plums are often beautiful in size, form, and color. The trees are of only moderate size in the orchard, but although small they are productive and bear regularly, their chief defect being susceptibility to sun scald, whereby the bark on the tree is killed. Reine Claude is still one of the most profitable plums grown in New York — probably the most profitable green variety — and both in commercial and home plantations deserves a place in the plum orchard.

YELLOW EGG

Yellow Egg is the largest and the handsomest of the yellow plums and is well worth consideration by either the amateur or the commercial fruit grower in New York. At best, however, it is fit only for cooking and is none too good for culinary purposes. The trees are very satisfactory on all but light soils. If the quality were only a little better we should heartily recommend it as a yellow plum for home and for commercial markets in this state.*

*See "Plums of New York," by Professor Hedrick. Published by State Agr. Exp. Sta., Geneva, N. Y.

CULTURAL METHODS AND PRUNING FOR PLUMS AND PRUNES

GEORGE H. HOWE

Assistant Horticulturist, New York Agricultural Experiment Station,
Geneva, N. Y.

LOCATION



Plums and prunes, like all other fruits, thrive best in localities geologically and climatically adapted to their growth. In general, however, the location of plum orchards is rather elastic and admits of a wide range of conditions. Regions in New York most suited to the culture of plums are the elevated and sloping lands bordering the Great Lakes, the Central Lakes of western New York and the Hudson River Valley. Besides the localities named, there are many others about the waterways of the state and also upon the elevated plateaus of the western interior and upon the slopes of the eastern mountain ranges. In almost any section of the state suited to general farm crops, where the seasons are not severe and where late spring frosts are infrequent, plums may be grown.

SOILS

Plums, perhaps more than any other fruit unless it be the apple, will succeed on a great diversity of soils. Good drainage seems to be the prime requisite for the success of plum culture. When the European sorts and all the various American species are considered, each having wide diversities of soil adaptation, it is readily seen that a selection of varieties to cover a broad range of soils is possible. This being so, some varieties of plums can be grown on almost any soil not entirely prohibitive of plant growth.

The Domesticas and Insititias, the two best widely cultivated species in New York, grow best on rather heavy clay loam. They will thrive on lighter soils, but the choicest fruit usually

comes from the large productive orchards grown on heavy soil. Heavy clay loams are not necessarily cold and wet; they may and should be well drained and comparatively warm. The Japanese plums, almost as widely grown in New York as the Domesticas, seem to succeed well on light soils. A light, sandy or gravelly loam suits them best, although they will thrive on soils containing more sand or clay than normal ideal types. The American plums require much the same soil as that adapted to the Domesticas. A rich heavy loam composed of rather stiff clay is most suitable, but soils in which moderate amounts of sand prevail do not interfere with a thrifty growth in favorable climates. The Hortulana and Munsoniana plums, while not fastidious as to soils, do best on comparatively light types of soil such as those on which the Trifloras flourish.

EXPOSURES

The slope of the land for plum orchards in general is not of greatest importance. All conditions being equal, a southeastern exposure is best. Only cold, backward soils require a southwestern slope. Where late spring frosts prevail, a northern exposure is most suitable to retard blooming time. The Japanese varieties, being particularly early bloomers, require more or less consideration in this respect. With most other species, the direction of the slope makes but little difference, but the greatest success is attained where there is enough slope for air and water drainage.

DRAINAGE

The more improved the mechanical condition of the soil, the more quickly do plum trees, like other plants, respond. The rather stiff clay loams already mentioned must not be heavy and damp, but well drained, to admit of effective plum culture. Some plums will stand rather more water than any other tree-fruits, but such a notion should not be relied upon too far when the question of drainage arises. The specific purpose of underdrainage is to make the soil warmer and drier during wet weather, and cooler and moister during drouth. Well-drained soils are also conducive to greater ease of cultivation, and the combination of these two factors strongly influences the adaptability of available plant food.



FIG. 384.—BURBANK UNPRUNED, SHOWING THE RANK SPRAWLING GROWTH OF THE TRIFLORAS

PLANTING

It is the general custom in New York to set plum trees from twelve to twenty feet apart. The space given the trees seems to depend somewhat upon the type of the soil and the variety to be set, though very often the custom in the locality is followed. Strong growing varieties, such as the Domesticas, require more space than others, and it is the rule of plum growers to give more room to the trees than formerly. In mixed plantations where modern methods of culture are practiced, a distance of twenty or even twenty-five feet apart each way is not excessive. Dwarf varieties thrive well when closely planted, but strong, vigorous growing kinds require the greater distance. Occasionally, instead of planting trees an equal distance apart each way, growers prefer to place the trees at a distance of sixteen to twenty feet in

rows forty or fifty feet apart and grow some other crop between. This custom, however, has never found widespread favor. Mixed planting for cross-pollination has demanded but little attention in this state. Most commercial orchards consist of *Domesticas*, and this species under ordinary orchard conditions seem to be self-fertile.



FIG. 385.—BURBANK PRUNED, WITH THE EXCESS GROWTH REMOVED BY HEADING-IN

The relative advantages of fall and spring planting are often discussed. Very much depends on the locality, season, condition of the trees, and the soil. Trees whose wood is thoroughly hardened and ripened might be set in the fall in soil which is well prepared, but the practice cannot be recommended. As a rule, it would be much better to store the trees in a suitable cellar through the winter and plant in the spring. Of course, fall planting sometimes has the advantage of enabling the grower to

get the orchard started at a season when the rush of work is lighter than in the spring. Nevertheless, but few species of plums can often be set in the fall without danger of considerable loss.

In this region it is common practice to plant plum trees two years from the bud. Occasionally three-year-old trees, if slow-growing sorts, are used. Trees of the Japanese varieties are frequently planted at a year from the bud. Such young stock can be handled and shipped cheaply, but it is not often to be recommended. Some growers, however, prefer this young stock, not only because it is cheaper, but because it is easier to set than are older trees.

CULTIVATION

Plum orchards, like those of all other tree-fruits, should be tilled. Horticulturists and growers are agreed upon this practice. Tillage usually commences with plowing in the spring, followed by cultivation during the summer until the first or the middle of August, at which time a cover crop of clover, oats, or barley is sown. Plowing in the spring should be done as soon as the ground is dry enough to work with advantage. It should be sufficiently deep to insure a good heavy mulch when cultivation commences. Plums and prunes seem to need more water than do other tree-fruits, often thriving luxuriantly on rather moist land. Cultivation is necessary to conserve this moisture.

Plum orchards growing in sod seldom prove successful, and it is commonly stated that brown rot is more serious under such conditions. In tilled orchards, much of the mummied fruit which carries the fungus through the winter is buried by the plowing and does not come to life. The summer tillage is important. Disking following the plowing is frequently practiced, especially if the soil is heavy and lumpy. During the summer, however, a spring-toothed harrow is the most successful tool. Cultivation should not be too deep, but should be thorough. The orchard in which abundant moisture prevails is the one having the best mulch.



FIG. 386.—AN ORCHARD OF BURBANK TREES SHOWING THE LOW, VASE-FORMED HEADS NOTE THE GENTLE SLOPE OF THE LAND

COVER CROPS

The value of cover crops in orchards is very generally recognized by plum growers. They protect the trees from cold by holding the snow around the trunks and keeping the soil from washing — a great advantage in hillside orchards. When turned under, these cover crops add humus to the soil, together with nitrogen, if of a leguminous nature, and change the physical character of the soil. Prolonged cultivation in the fall fails to allow the trees to mature the season's growth. Such a condition is avoided by the use of cover crops.

There is still another feature regarding the use of cover crops which is often overlooked. Orchards in which they are regularly grown require less fertilizer than those in which no such crop is grown. Leguminous crops are not entirely necessary to bring about such a result. By the simple modification of the physical character of the soil, the availability of plant food is greatly increased. Besides, the plants of the cover crops gather food from the soil and air, and this in turn is assimilated by the trees. The most satisfactory cover crop depends upon the locality and the character of the soil. For light soils, cowpeas and crimson clover are good. Mammoth clover, peas, rye, oats, or barley are best adapted to heavier soils. Heavy seeding is to be preferred to light, inasmuch as the latter will establish but a scant cover, which is little better than none at all.

FERTILIZERS

The ideas governing the use of fertilizers in plum orchards are very diverse. No definite principles have ever been laid down, and the results obtained have always been obscure. Too often, fertilizer has been applied to soils not requiring it, or at most in small amounts. It is unquestionably true that much has been wasted, even though it is a well-known fact that plums and prunes require rich soils. In many orchards on heavy soil, good tillage and the use of cover crops obviates much of the use of fertilizer. Plum trees grow during a long season, their roots penetrate deeply and spread widely, their leaves transpire much water, and hence they thrive well on diluted solutions of plant food. Most of the plum crop is water, and it therefore requires for



FIG. 387.—BAYAY UNPRUNED, SHOWING THE VIGOROUS GROWTH MADE BY THE DOMESTICAS

growth an abundance of moisture rather than increased quantities of food. To be sure, some fertilizer is frequently needed, but it should be applied with care and intelligence to avoid waste. Fruit growers are coming more and more to believe that it pays to experiment carefully before applying fertilizer to their trees.

PRUNING

Generally speaking, plum trees do not require so much pruning as apple trees. In fact, a new notion prevails among many horticulturists to prune all fruit trees as little as possible. Most of the *Domestica* plums naturally form fairly good heads, and only occasional branches need to be removed to prevent the tops from becoming too thick. The native sorts and many of the *Americanas* form such dense, thorny heads that, unless some pruning is given, picking the fruit would be nearly impossible. It is common experience, however, that, no matter how well such species are pruned, they still remain scraggly, crooked, and ungainly. Heading-in would make their tops so thick as to be practically impenetrable.

Rank, sprawling growers, such as Burbank, need severe heading-in each year. All of the *Trifloras* require more pruning than do the European sorts, since most of the fruit is borne on the preceding season's growth and the bearing wood should be kept near the trunk. In the commercial orchards of the state it is the practice to form the heads of the *Trifloras* by removing the leader and leaving a vase-formed head. After this form is established subsequent pruning is light, since it consists of removing only injured and surplus branches and cutting back long, slender growths. In the case of the *Domesticas* and *Insititias*, a central trunk is left with three or four main branches. Future pruning consists merely of thinning out crowded branches and removing injured ones. Trees making an excessive growth, however, should be cut back. It has long been the custom to cut severely the rank growing varieties, such as those of the *Triflora* species, but the advisability of this practice is doubtful, as the more such plums are pruned the more they will need pruning in the years to follow. It might be better to decrease the food supply and prune but little, although on rich soils the trees would become unmanageable unless some pruning was given year by year.



FIG. 388.—BAVAY PRUNED, SHOWING THE CENTRAL LEADER WITH THE BRANCHES CUT BACK

The system of pruning is really a matter of local and personal practice, and no definite rule can determine it. Many growers contend that the more severely plum trees are pruned and headed-in, the more easily are they cared for. Spraying is easier and the fruit is picked with less effort. A greater number of trees can be handled on an acre. Under such treatment, however, the thrift of the trees often seems to be impaired, and in some cases after a few years smaller crops are realized.

The formation of a suitable head on young trees is a matter of much importance. The surest way of success is to select only

clean, strong two-year-old trees with good roots, and to plant these with care so that they make a vigorous, healthy growth during the first few years. In the past, plum trees have been headed three or four feet from the ground, but the present tendency is to head them lower. No difficulty in tilling should be experienced, even if the trees are headed low.

Pruning should be done when the trees are dormant. It is usually preferable to wait until the coldest weather is past to make allowance for possible winter injury. The pruning operation should be governed by the same principles and practical judgment that constitute the basis for all successful pruning. Large wounds should at all times be avoided if possible. As such wounds rarely heal, they exude considerable gum, which is injurious to the health of the tree. They also furnish various fungi a means of access to the tree tissues.

THE COMMON INSECT ENEMIES OF THE PLUM

F. H. LATHROP

Assistant Entomologist, New York Agricultural Experiment Station,
Geneva, N. Y.



In the production of fruit of standard quality, the grower cannot afford to ignore the depredations of the insect enemies of his crop. This is not less true of the plum than it is of other fruits, and if the grower hopes to conduct his orchard operations successfully and economically, he should familiarize himself with the appearance and habits and the means of control of the common injurious insects of this fruit. For the sake of convenience, the species discussed in this

paper may be grouped as follows: insects attacking the fruit, plum curculio, plum gouger; insects encrusting the bark, San José scale, European fruit-tree scale, Putnam's scale, European fruit Lecanium; insects attacking the leaves and stems, plum plant louse, hop plant louse, mealy plum louse, rusty-brown plum aphid; insects attacking the trunk and limbs, fruit-tree bark beetle, lesser peach-tree borer, American plum borer.

INSECTS ATTACKING THE FRUIT

The Plum Curculio

Plum curculio, *Conotrachelus nenuphar* Herbst, is a species native to America, feeding on wild plum and hawthorn, and one of the most serious pests of plums in New York. It also attacks prunes, peaches, cherries, and other stone fruit.

The injury to plums is caused by the presence of the larvae in the fruit by the adults for the purpose of egg deposition and for feeding. The injured fruit which often ripens prematurely and falls to the ground, will usually be found, on examination, to bear egg and feeding punctures and to be wormy.

The adult is a rough-bodied snout beetle about one-fifth inch long, of a brownish color mottled with gray and black. About the time the buds open in spring, these beetles emerge from their winter quarters. They begin feeding as soon as the fruit has set, making small round holes through the skin and eating the pulp. The eggs are deposited just beneath the surface of the plum, in characteristic, crescent-shaped punctures. The small, grublike larvae that soon emerge from the eggs burrow into the fruit, and within two or three weeks become full-grown, when they leave the fruit and enter the ground to pupate. The adults that emerge about four weeks later, feed until fall and hibernate in debris in the orchard or in adjacent woodlands.

Control. Spraying with arsenate of lead has been found effective in holding this insect in check. The first application should be made just after the petals fall, and the second a week or ten days later, using three pounds of arsenate of lead to fifty gallons of water. Some producers use the arsenate in the same proportion with bordeaux mixture, 2—2—50, or self-boiled lime sulphur wash, 8—8—50, thus making a combined insecticide and fungicide. Bordeaux mixture should not be used on Japanese varieties, however. For many years jarring was extensively employed, but now it is seldom used on a commercial scale. The pupae, which are within an inch or two of the surface of the ground, may be destroyed by shallow cultivation at frequent intervals from July 10 until August 10. The eradication of winter quarters will reduce the number of beetles in spring.

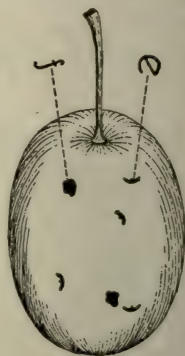


FIG. 389.—
YOUNG PLUM
SHOWING INJURY
BY CURCULIO. (e)
EGG PUNCTURE;
(f) FEEDING
PUNCTURE

The Plum Gouger

Plum gouger, *Coccotorus scutellaris* Le Conte, is a serious pest of plums and allied fruits in the north central states and the western Mississippi Valley. The injury to the fruit may easily be mistaken for work of the curculio, but the adult is readily distinguished by the yellow head, thorax, and legs, and the dun-colored wing covers.

In early spring the eggs are deposited just beneath the surface of the fruit, and the grubs burrow into the pit, where they feed and finally pupate. The beetles emerge in the fall and feed for a short period before hibernating.

Control. Spraying as recommended for curculio is probably the most satisfactory means of control for this pest. Jarring has also been advised.

INSECTS ENCRUSTING THE BARK

San José Scale

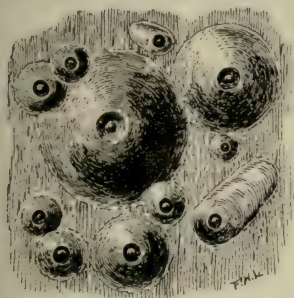


FIG. 390.—SAN JOSÉ SCALE

San José scale, *Aspidiotus perniciosus* Comstock, is a destructive pest found most commonly on the smaller limbs and branches of the tree, but all parts may become infested, including the trunks of small trees and the leaves and fruit where infestation is heavy. The affected bark presents a dull grayish granular appearance, due to a thin ashy encrustation, which when scraped

away reveals the minute yellow bodies of insects. Close examination shows a single scale to consist of a circular shield of grayish or blackish color, with a tiny protuberance in the centre—the “nipple,” as it is called, about which are a number of concentric circles. By raising this shield with a pin, the tiny, yellow, and almost shapeless body of the insect may be seen.

In New York during the latter part of May the insects after having passed the winter are mature, and about a month later the females begin to give birth to living young. These small insects, which are provided with eyes and legs, move about over the bark for a short time, but finally settle down, and do not move again. After a few days when the insects have formed protecting scales, the eyes and legs are soon lost. In this latitude there are several generations a year.

Control. San José scale may be controlled by spraying with lime-sulphur wash in spring when the trees are dormant. In case of severe infestation, a similar application may be made in the late

autumn. The lime sulphur wash may be made at home,* using the 40—80—50 formula; or the commercial concentrated solution (testing 32 degrees Baumé*) may be obtained and diluted with eight or nine parts of water. In applying the wash care should be taken to cover even the smallest twigs. Some growers use miscible oil instead of lime-sulphur. If this is used, it should be applied only in spring when the buds begin to swell.

The European Fruit-tree Scale

While this pest, *Aspidiotus ostreæformis* Curtis, is much less important economically, it is nevertheless rather similar in habits and appearance to the San José scale, from which it may be distinguished by the orange color of the nipple, located in *A. ostreæformis* toward one side of the scale. Injury is done to plum, apricot, currant, and soft maple.

Control. This scale may be controlled in the same manner as recommended for the San José scale.

Putnam's Scale

This scale, *Aspidiotus ancyllus* Putnam, is practically indistinguishable from the European fruit-tree scale except by microscopic structures. Plums are sometimes badly encrusted by this scale, but it is a much less serious pest than is San José scale.

Control. When trees are sprayed for San José scale, this pest will not become seriously abundant.

The European Fruit Lecanium

This species, *Lecanium corni* Bouche, has occurred in this state in destructive abundance and is injurious to a large number of plants, including many of the stone and pome fruits, currant, blackberry, mulberry, and pecan.

The young scales pass the winter on the small branches, and with the approach of spring they make rapid growth, maturing in early spring. The mature female is a large, brown, soft-bodied scale about one-eighth inch long, closely resembling a halved pea attached to the bark. The male is whitish and smaller. The females lay a large number of eggs, and the insects hatching from

* See Bulletins 329 and 330, N. Y. Agr. Exp. Station.

them migrate to the leaves, causing them to curl and turn yellow. The scales produce honeydew, which accumulates on the tree and becomes infested with a black fungus, thus giving the tree an unsightly sooty appearance.

Control. Lime-sulphur wash as used for the San José scale should keep this species in check. Kerosene emulsion and miscible oils applied in spring as the buds begin to swell have also been recommended.

INSECTS ATTACKING THE LEAVES AND STEMS

The Plum Plant Louse

The eggs of the plant louse, *Myzus mahaleb* Fonscolombe, are deposited in fall on the terminal twigs of plum trees. In spring, light green wingless aphids hatch from these eggs and make their way to the terminal growth, where they breed until late spring. At this time winged migrants are produced, and the lice leave the plum to breed during the summer on various plants. With the approach of fall they return to the plum.

The Hop Plant Louse

This species, *Phorodon humuli* Schrank, is very similar in habits and appearance to the preceding aphid, from which it may be distinguished by minute structural differences. The lice breed on the plum during fall and spring, migrating to hops during the summer. Although this is a serious pest of hop vines, it is seldom abundant enough on the plum to be seriously injurious.

The Mealy Plum Louse

This aphid, *Hyalopterus arundinis* Fabricius, is of a pale green color marked by three longitudinal dark stripes, and covered by a whitish mealy powder. The lice spend the summer on various grasses, breeding on the plum during fall and spring.

The Rusty-brown Plum Aphid

This reddish-brown plant louse, *Aphis setariae* Thomas, is especially injurious in the South, and it sometimes becomes a serious pest in our own section. The life history is similar to that of the preceding species.

Control of Aphids

All of the above species of plant lice are so nearly alike in habits that they may be controlled on plum by the same methods. The aphids may be killed by thorough applications of a spray composed of two pounds of soap and one-fourth pint of tobacco extract to fifty gallons of water. Kerosene emulsion or whale-oil soap applied at summer strength may also be used.

INSECTS ATTACKING THE TRUNK AND LIMBS

The Fruit-tree Bark Beetle

Although dead or weakened tree limbs are most often affected by the bark beetle, *Scolytus rugulosus* Ratzeburg, injury is frequently done to healthy wood of many kinds of fruit trees. The attack is indicated by the presence of numerous small holes, resembling shot holes, in the bark of the tree. If the bark is removed, the "shot holes" will be found to connect with numerous tortuous channels between the bark and the sapwood.

The winter is passed by the larvae beneath the bark. These mature in spring, and the beetles, boring holes through the bark, escape. Later, the females bore into the tree in order to deposit eggs in tunnels under the bark.

Control. In early spring, before the beetles have emerged, all dead trees and branches, which serve as breeding quarters for the pest, should be removed and the prunings burned. Inducing rapid growth in spring will enable the trees to withstand the attack. Whitewash, to each pail of which one-fourth pound of salt has been added, tends to repel the beetles when applied to the trunk and larger branches.

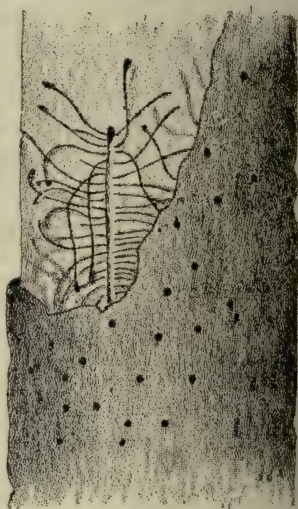


FIG. 391.—WORK OF THE FRUIT-TREE BARK BEETLE ON PLUM LIMB. A PORTION OF BARK HAS BEEN REMOVED TO SHOW THE BURROWS

The Lesser Peach-tree Borer

FIG. 392.—ADULT LESSER PEACH-TREE BORER

The larvae of the peach-tree borer, *Sesia pictipes* Grote and Robinson, burrow just beneath the bark of the trunk and limbs of various fruit trees, chief of which are peach, plum, and cherry. During the summer the larvae that have passed the winter, mature and transform into fragile, clear-

winged moths. The attacks occur most frequently on old trees with rough bark, especially near wounds, and are marked by an exudation of gum from the affected parts.

Control. The attacks may be considerably lessened by keeping the trees in good condition, free of loose bark, and so far as possible, safe from mechanical injury. In case of severe infestation, the larvae may be dug out and the wounds treated with a protective wash. Repellent washes seem to have proved of little value.

The American Plum Borer

The presence of this pest, *Euzophera semifuneralis* Walker, is evidenced by the accumulation of frass which the larvae throw from their burrows beneath the bark. The bark above the burrows is usually killed, and sometimes the tree is entirely girdled. The winter is passed by the pupae in small, white, silken cocoons under flakes of loose bark or in the frass at the entrance to the burrows. The adult is a small, grayish, inconspicuous moth.

Control. If the trees are kept in good condition, as recommended for the two preceding species, this insect should not prove to be a serious pest. Scraping away the rough bark during the winter will kill many of the pupae. The larvae may be dug out by hand, in case infestation becomes heavy.

DISEASES OF THE PLUM

LEX R. HESLER

Assistant Professor of Plant Pathology, Cornell University, Ithaca, N. Y.

BLACK KNOT



The black knot, which is caused by *Plowrightia morbosa* (Schw.) Sacc., is one of the most common diseases of the plum. It receives its name from the characteristic black excrescences or galls on the branches. The young swellings are at first covered by the bark. As the knots increase in size, the bark ruptures and the swollen surface becomes olivaceous; eventually, however, the galls become coal-black, hard, and brittle. The knots are

usually confined to one side of the twig or limb, so that death of the affected portion does not always immediately follow attack. On the other hand, in more severe cases the whole circumference of the branch is involved, and the food supply intended for the more distant parts is cut off. In such cases whole trees are finally killed (Fig. 393).

The disease originated in America and is peculiar to our native wild species of plums and cherries, although it is frequently destructive to certain cultivated varieties of plums and sour cherries. The knots are due to the work of a fungus, although for a long time it was believed that insects were the cause of the trouble.

The olivaceous ruptured surface of the knot is at first covered with the summer spores, or conidia, which are borne on short upright threads and are capable of causing infection during the same season in which they are formed. This infection occurs from May until the latter half of the summer. In August the knotted portion of the branch turns black and becomes brittle; the surface is then covered with very fine, pimply protuberances, each of which has an opening at its apex. These openings lead to flask-shaped



FIG. 393.—BLACK KNOT ON PLUM

cavities of the winter fruiting-bodies, which are known as perithecia. The perithecia contain numerous club-shaped sacs, each of which in turn bears eight winter spores, or ascospores. By March or April these spores are matured, and at this time, or possibly a little later, they are shot during rainy periods from the sacs through the openings mentioned above. The air currents carry these spores to other limbs, and apparently they gain entrance on actively growing tissue or through wounds. The young knots very soon begin to appear as previously described.

About 1850, turpentine, kerosene, and other washes were applied to the knots, but forty years later "the heroic use of the knife" was the recognized remedy. The eradication of the knots has been the subject of legal enactments in several states, including New York.*

In removing the knots, it should be remembered, first, that the summer spores are produced abundantly from May until late in the summer; secondly, that the winter spores develop late in winter or early spring and are discharged with the warm April rains. Therefore, the knots should be removed before either type of spores are produced; in other words, diseased limbs should be eradicated in the fall or early winter. Watch closely for the appearance of any young knots in the spring; these, if found, should be removed at once. Spraying alone for this disease is not effective.

BROWN ROT

The brown rot, caused by *Sclerotinia cinerea*, is next in order of seriousness among the diseases of the plum. It may be very destructive one year and of relatively slight importance the following season. In years of full fruitage, accompanied by damp, warm weather, the disease is most troublesome. But the weather is not the direct cause of the rot; a fungus is directly responsible, the weather only offering the proper conditions for the development of the fungus.

The fruits are the common seat of the injury, although the blossoms and twigs are quite susceptible (figs. 394 and 395). The fruit is attacked as it approaches maturity, turning it brown, soft, and worthless. At first the rotted areas are small, circular, and brownish. These rapidly enlarge until they involve the entire

* Section 304 of the Agricultural Law.



FIG. 394.—BROWN ROT ON PLUM FRUITS

fruit, which at the same time shrinks slightly. As decay advances, small tufts of grayish threads of the fungus appear near the center of the original spots. Later the whole fruit is dotted with these tufts (Fig. 394.) From these tufts the summer spores are developed, which are distributed the latter part of the summer to other fruits. These spores live over until the following spring, when they become a source of trouble again by producing infection.



FIG. 395.—BROWN ROT CANKERS ON PLUM TWIGS

If the fruit hangs in clusters, adjacent plums decay at the points of contact, and the fungus thus spreads from fruit to fruit until the whole cluster is lost. Fruit may also suffer after it is picked; plums that were apparently sound at picking may be rotted seriously in transportation, so that when they reach the market

they are in poor condition and of inferior quality, or may be an entire loss.

Diseased plums may fall or they may cling to the tree; in either case they shrivel, due to the loss of water, and become the "mummy" so familiar to orchardists. It has been stated that the summer spores may live over winter. In this connection it should also be borne in mind that the fungus also passes the winter in the mummies just mentioned. From the mummies, which cling to the tree throughout the winter, there is developed, in the spring, a new crop of the summer spores. These infect the blossoms and young fruits. From the fallen mummies in the spring, there arise cup-shaped, stalked bodies. These organs furnish another kind of spores, known as ascospores, for the spring infection of blossoms.

The diseased blossoms become brownish and often are confused with frost effects. The causal fungus may spread from infected blossoms to adjacent twigs through the flower stalks. Twigs and limbs may also become diseased from the infected fruit, the fungus growing directly through the fruit stalk into these organs. The twigs and limbs are also infected through wounds in the bark.

The control of plum brown rot, based on the foregoing statements, proceeds as follows: The fruit should be protected by spraying with lime-sulphur solution, 1-50. Since moisture is highly favorable to the disease, the tops of the trees should be so pruned as to admit sunshine, the heat of which evaporates the moisture. The fruits should be thinned so that no two touch, for, it will be remembered, the fungus is able to travel from one plum to another if the fruit hang in clusters or touch one another. The extermination of mummies, in which the fungus hibernates, is doubtless of some value; this method alone fails in that the complete destruction of all the mummies is never accomplished.

LEAF SPOT

This disease is caused by *Coccomyces prunophoræ* Higgins. Many of the stone fruits suffer from fungi which produce a shot-hole trouble. In such cases the leaf is killed in more or less circular areas, which dry up and fall out, leaving a shot-hole

appearance (Fig. 396). In severe cases of leaf spot, the foliage very frequently turns yellow; hence it is called "yellow leaf." It is clear, then, that yellow leaf and leaf spot are names for the same disease. Infections on the Japanese varieties of plum are chiefly of a shot-hole nature, but there is practically no defoliation as in the case of the European plum varieties.

This disease is not confined to the plum, but may seriously affect sweet and sour cherries, both wild and cultivated. It assumes great importance in the nursery and is destructive to trees of plum and cherry orchards.

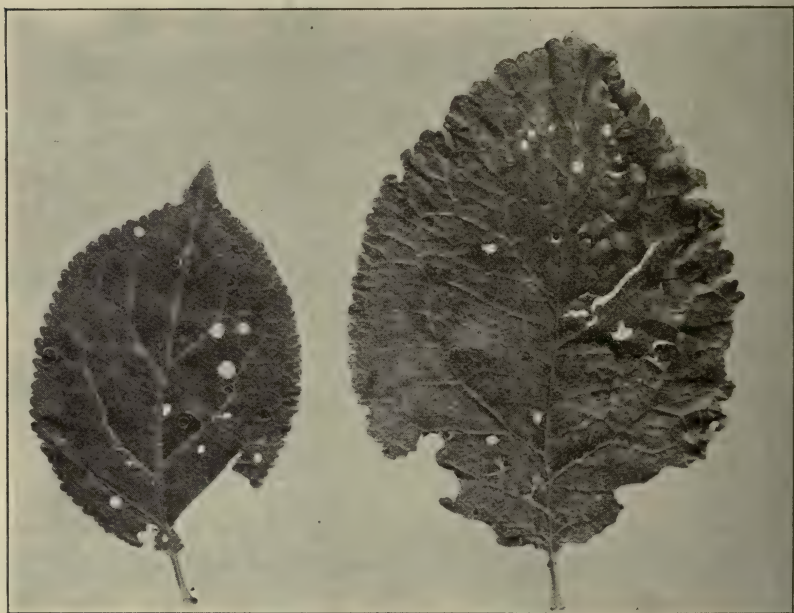


FIG. 396.—LEAF SPOT OF PLUM. NOTE THE SHOT-HOLE APPEARANCE

The leaves are the chief organs attacked; however, the fruit and fruit stalks are not exempt. The spots appear at first as slightly discolored areas, usually not exceeding an eighth of an inch in diameter, and more commonly about half that size. After a week or ten days, the spots become very definite in outline, and assume a reddish-brown color. In wet weather, small white, velvety pustules are observed on the lower surfaces of the leaves, opposite the discolored spots. These pustules occasionally occur



FIG. 397.—PLUM POCKETS, OR PLUM BLADDER ON THE FRUIT

on the upper side of the leaf. Finally, the foliage may turn yellow and fall prematurely.

It has been determined that the fungus hibernates in the old leaves on the ground. In the spring, when the trees are developing the first new leaves, quantities of spores (in this case, ascospores) are discharged from specialized organs in the old, fallen leaves. These spores are blown to the new foliage, where, after a week or ten days, they produce spots. Very soon, on the lower surface of the leaf, the whitish pustules appear as previously described; these pustules are masses of summer spores produced by the fungus in the leaf. The spores spread the fungus throughout the summer, resulting in a wide distribution of the disease.

Bordeaux mixture at 5-5-50 or lime-sulphur solution 1-50 may be used for the control of this disease, although the former often causes burning of plum foliage. Since infections begin with the appearance of the first leaves in the spring, the first spraying should be made about ten days after the blossoms fall. Destruction of old leaves, which harbor the fungus from the previous year, is a measure in itself unreliable, but, of course, is good practice supplemented by spraying.

PLUM POCKETS

Plum pockets, or plum bladder, cause by *Exoascus Pruni* Fuckel, is a name which arises from the peculiar pocketlike or bloated appearance of affected plums (Fig. 397). The trouble is caused by a fungus closely allied to that causing peach leaf curl. The disease is not very prevalent and most injurious when the spring is cold and damp. It is therefore erroneously believed to be due to cold, humid weather; but, as stated above, a fungus is the direct cause.

The fungus attacks the plum at an early stage of growth, either while yet a fruit bud or soon after the blossoms fall. The invaded tissue of the incipient fruit is stimulated by the fungus, doubtless by some slightly poisonous secretion, and the result is the production of an abundant spongy growth until the whole form of the plum is enlarged and distorted. In reality, the pulp and stone of the fruit are replaced by a thin, soft, inflated shell, and in place of the seed there exists merely a hollow cavity. The

diseased fruits may be distinguished from the healthy fruit by their pale yellow color. Later, the affected plums become coated over with a fine powdery substance; this consists of the spores of the causal fungus. Finally, the diseased fruits turn black and fall. The further history and function of the spores mentioned above is not well known.

The disease is local in nature. It may attack a single tree, every plum on the tree bearing pockets, while surrounding trees remain unaffected. A tree once affected continues to bear pockets in succeeding years, if weather conditions are favorable. Some claim that this is evidence that the fungus hibernates in the twigs and that infection in the spring is accomplished by the resumption of growth of the fungus.

Control measures consist in spraying before the buds open with bordeaux mixture 4-4-50, or lime-sulphur 1-15.

MARKETING PLUMS AND PRUNES

GEORGE H. HOWE

Assistant Horticulturist, New York Agricultural Experiment Station,
Geneva, N. Y.

One of the leading problems in marketing plums and prunes is to have good fruit. Given such fruit, a market can usually be developed for almost any quantity. In New York there can probably be grown a larger number of varieties of plums than of almost any other cultivated fruit, and the range of flavor, texture, color, size, and form is also greater. With the great variability of this fruit and the adaptation of the different varieties to diverse climatic and soil conditions, the problems of marketing should not be so complex as they are at the present time. One great difficulty with the plum industry today is due to the fact that it is hampered by the marketing systems now in vogue.

PICKING

In New York and in most states east of the Mississippi plums are harvested and placed on the market just before they reach an edible condition. Farther west, however, they are picked much greener. The need of early picking in this state is due to the fact that the fruit may be handled and shipped more readily, and danger of the crop being destroyed by the brown-rot fungus is lessened. If the weather is warm and muggy it is extremely important that the fruit be picked early. A delay of a few hours will frequently cause severe loss from brown rot. Many of the Japanese plums may well be picked from a week to ten days before fully mature; even then they will develop a good color and flavor. The Domesticas, on the other hand, need not be picked quite so green. Plums used for jelly or conserves should be picked as soon as they are full-grown and long before they are thoroughly ripe. The fruit should always be perfectly dry when harvested; otherwise it is almost sure to decay before reaching the market.

Divers utensils are used in connection with picking. Ladders, baskets, and the manner of conveyance from orchard to packing house, all depend upon the judgment of the individual. Of course plums are always hand picked, and good growers exercise great care so as not to bruise them or destroy the delicate bloom. Unfortunately, however, many pickers are careless and do not observe these important details.

PACKING

In New York the plum crop as a rule is sent to market in six-, eight-, and ten-pound grape baskets, the smallest of these receptacles being at present preferred. Four-pound baskets are occasionally used. The fruit should always be conveyed from the orchard to the packing house for preparation for market. The grower who ships his plums just as they are picked, or who packs in the field, always receives inferior returns. In the packing house, preparations for shipping can be carefully made, inasmuch as the package and its appearance advertise the product. Western-grown plums coming to this state are usually wrapped singly in tissue paper as an aid toward safe shipment, as well as to increase their attractiveness. Such a custom has rarely been followed in New York, but it would seem that choice specimens might profitably be handled in this manner for fancy trade. Sorting, grading, facing, and marketing of the packages depends almost entirely upon the judgment of the individual, and no definite rules can be laid down. Every new idea for an attractive package should always be given careful consideration.

STORING

Most plums are seldom stored longer than a week in common storage, and the limit in cold storage for the majority of varieties is three or four weeks. With proper precaution, many of the late plums and some of the prunes could be stored for a much longer term. Domestica and Insititia varieties at the Geneva Experiment Station have frequently been kept a month or longer in common storage without unusual precaution. There is a vast difference in keeping qualities of plums, since certain varieties can now be found which can be stored for some time. Already

nurserymen have offered to growers new sorts which are recommended for keeping a long time after picking. This leads to the belief that there is an opportunity for the breeding of late keeping varieties.

PROBLEMS OF MARKETING

Marketing plums like the marketing of all other commodities is beset with perplexities. It is a business quite by itself and it is difficult to recommend any set rules. A business man endeavors to follow the lines of least competition; the same is true of the plum grower. A good local market without doubt offers the producer the best means of disposing of his fruit, since the fruit reaches the consumer direct and eliminates the middlemen. With plums, as with all fruits, improper distribution is the greatest barrier against good prices. Not until the middlemen are eliminated and the grower can deal directly with the consumer, either through cooperative associations or similar organizations, will fruit distribution be controlled and satisfactory prices established. The chief drawback in handling the plum crop at the present time is that there are too many men and too much machinery involved to do the work cheaply. Seldom, too, can the fruit be handled on a large enough scale to be profitable, due to a lack of capital by the grower or local buyer. Many growers, fearing western competition, have ceased planting plum orchards — in fact have been removing their trees. It would sometimes seem that such fears are groundless, for, with proper facilities and methods of marketing, eastern-grown fruit ought to take foremost rank and bring the best returns. Many western growers are at present turning to manufactured products as an outlet for their plums. Here in New York, however, there is but little outlook at present for the turning of the surplus crop into by-products. Practically the sole outlet for the plum in the east is in selling for canning, since this region cannot compete with the west in the making of prunes, and European by-products are not in demand in America. There are a number of products, such as preserves, jellies, plum butter, marmalades, and the like, which could undoubtedly be profitably marketed, thus offering a means of utilizing the surplus fruit.

VARIETIES

A word only may be added concerning varieties. In making market plantings but comparatively few varieties are chosen, and the appearance and shipping qualities of these are supremely important. Always certain varieties of these are the best sellers in certain markets. For instance, Damsons are required in some places, while in other localities plums of the Green Gage type are in demand. As mentioned elsewhere in this text, under the discussion of varieties, Bradshaw, Green Gage, Lombard, Shropshire, and French Damson are perhaps the leading commercial sorts for the several plum-growing districts in the state. The selection of varieties is after all a personal matter and recommendations are hard to make. Local and geographical adaption, personal preferences of the grower, and the intrinsic qualities of the variety, all enter into the problem of varietal selection for market purposes.

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF PLUMS
AND PRUNES IN NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Albany	42,230	13,842
Allegany	10,420	1,883
Broome	8,901	3,524
Cattaraugus	8,973	1,464
Cayuga	14,913	6,708
Chautauqua	15,848	9,578
Chemung	5,375	2,529
Chenango	5,414	2,044
Clinton	5,111	84
Columbia	17,433	7,784
Cortland	5,641	1,883
Delaware	8,992	3,105
Dutchess	14,690	10,731
Erie	25,301	10,580
Essex	2,591	495
Franklin	511	24
Fulton	907	240
Genesee	13,525	8,916
Greene	19,242	9,018
Hamilton	51	12
Herkimer	6,157	3,853
Jefferson	2,856	857
Kings		
Lewis	560	119
Livingston	7,943	3,839
Madison	9,462	4,903
Monroe	92,986	75,259
Montgomery	9,001	4,411
Nassau	216	72
New York		
Niagara	180,801	148,792
Oneida	11,686	6,177
Onondaga	20,226	11,066
Ontario	52,603	32,761
Orange	11,479	4,617
Orleans	26,313	25,971
Oswego	12,529	8,335
Otsego	10,569	3,525
Putnam	2,353	1,046
Queens	3	
Rensselaer	13,935	5,163
Richmond	28	
Rockland	3,931	1,438
St. Lawrence	1,155	135
Saratoga	11,039	3,257
Schenectady	7,204	2,337
Schoharie	17,484	6,466
Schuyler	18,301	12,148
Seneca	33,190	26,895
Steuben	20,258	7,747
Suffolk	2,423	823
Sullivan	2,811	702
Tioga	5,507	2,253
Tompkins	9,908	4,438
Ulster	24,138	10,990

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF PLUMS
AND PRUNES IN NEW YORK STATE, BY COUNTIES — *Concluded*

<i>County</i>	<i>Trees</i>	<i>Busbels</i>
Warren	2,578	1,161
Washington	7,842	2,910
Wayne	21,976	15,711
Westchester	2,194	1,350
Wyoming	9,462	3,849
Yates	19,841	13,702
The State	919,017	553,522

THE QUINCE

"They call for dates and quinces in the pastry."

ROMEO AND JULIET IV, 4:2.

[1207]

QUINCES

II. L. BROWN, WATERPORT, ORLEANS COUNTY, N. Y.



The first considerations in growing and cultivating the quince should be soil and location. Both are very important. Select a high, well-drained clay loam with especially good air drainage, for the quince is very tender in bud and blossom, hence very susceptible to late spring frosts.

VARIETIES

There are a number of varieties of the quince, but as a commercial proposition we consider but one worth mentioning — the Orange.

DISTANCE IN PLANTING

Almost all quince trees have been planted too close. From twelve to fifteen feet is recommended by nearly all nurserymen, but we consider eighteen by twenty, or twenty by twenty, to be most suitable.

CULTIVATION

We prefer clean cultivation, but are frequently forced to the sod mulch owing to the great susceptibility of the quince to fire blight. This blight takes two forms — that of the twig and that affecting the body. Sometimes it will confine itself to the twigs exclusively; then again it will strike to the big wood and destroy the entire tree in a short time.

FERTILIZATION

There is nothing better for the quince than annual dressings of stable manure, but in the absence of this we use potash, phosphoric acid and nitrate of soda as follows: Phosphoric acid, from 500 to 700 pounds per acre every year on mature trees; nitrate of soda, from 200 to 300 pounds per acre if the trees appear to need it; muriate of potash in the same amounts and under the same conditions as nitrate.



FIG. 393.— EXAMINING THE FRUIT



FIG. 399.—AN INDIVIDUAL TREE IN ORCHARD OF H. L. BROWN, WATERPORT, N. Y.

PRUNING

In pruning we prefer the single stem method. We thin out the top and head back for the first two or three years; then discontinue to head back, just keeping a good, well-thinned head.

INSECT ENEMIES

The borer and curculio are the two most injurious enemies of the quince. Dig out the borers. For the curculio spray with arsenate of lead, four pounds to fifty gallons of water; or jar the trees, catching the insects in a canvas or other suitable receptacle.

The quince Lecanium, a scalelike insect, is sometimes troublesome; this we treat in the dormant state with oil emulsion, one gallon to fifteen gallons of water.

DISEASES

Leaf spot and fruit spot are controlled by either a lime-sulphur or a bordeaux spray, of the same strength as that used for apples.



MARKETING

We have tried both barrels and baskets for packing, but have found the barrel more satisfactory. The demand for the quince is not to be compared with that for the apple, pear, or peach, since it is used only for culinary purposes. It is never eaten out of hand. If properly cooked, it is very delicious. As to profit, the quince compares quite favorably with the apple.

TABLE SHOWING NUMBER OF TREES AND PRODUCTION IN BUSHELS OF QUINCES
IN NEW YORK STATE, BY COUNTIES

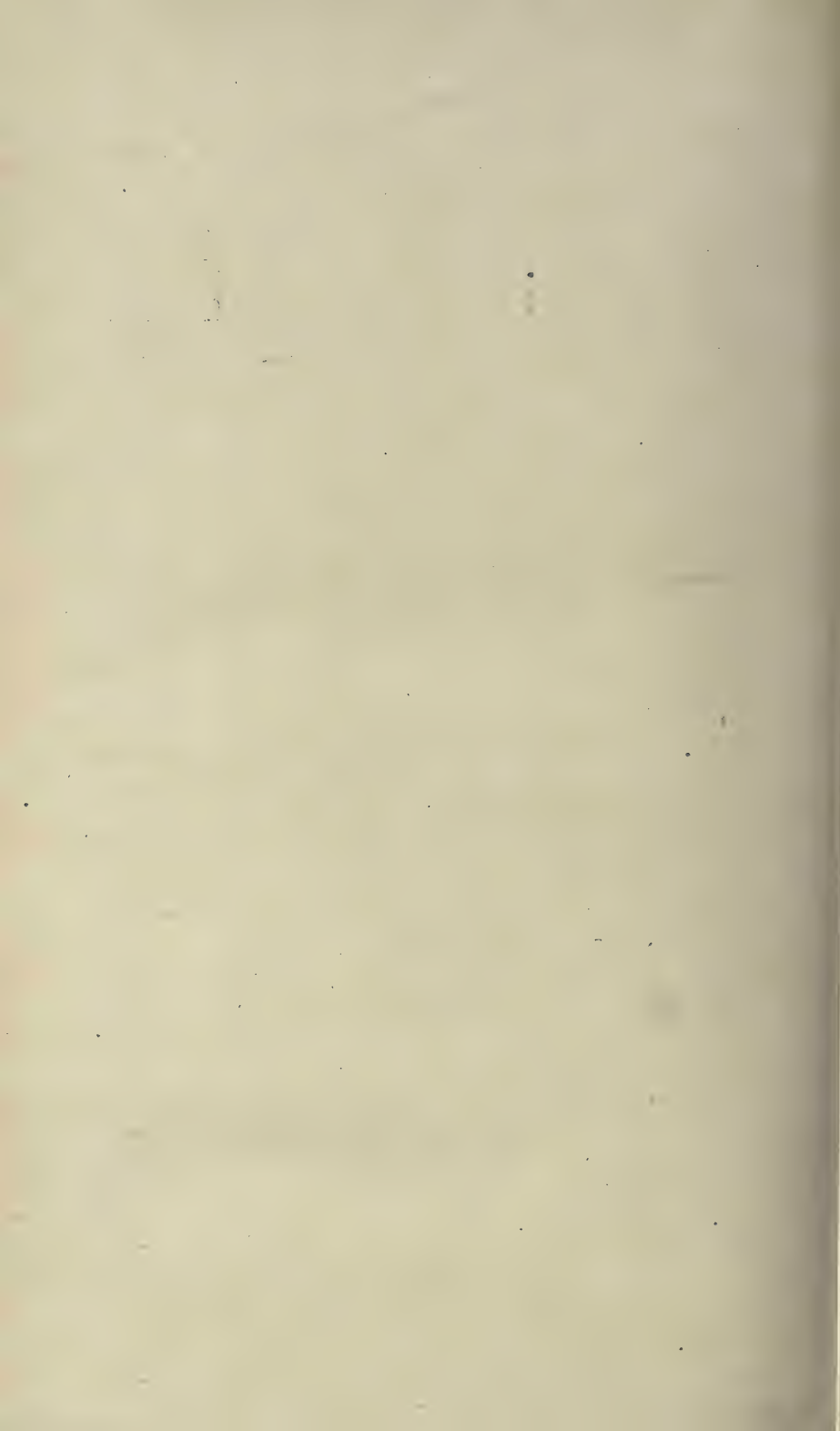
(Taken from U. S. Census, 1910)

<i>County</i>	<i>Trees</i>	<i>Busbels</i>
Albany	510	603
Allegany	85	10
Broome	35	4
Cattaraugus	172	33
Cayuga	1,829	507
Chautauqua	2,951	2,020
Chemung	45	6
Chenango	8	.....
Clinton	1	.....
Columbia	1,180	278
Cortland	42	13
Delaware	45	24
Dutchess	1,242	382
Erie	4,524	1,229
Essex	4	.....
Franklin	3	1
Fulton	14	.....
Genesee	4,038	1,975
Greene	652	360
Hamilton . . . . .	.....	.....
Herkimer	6	.....
Jefferson	5	2
Kings . . . . .	.....	.....
Lewis . . . . .	.....	.....
Livingston	880	273
Madison	31	12
Monroe	30,121	25,842
Montgomery	37	4
Nassau	174	128
New York . . . . .	.....	.....
Niagara	58,296	56,124
Oneida	36	1
Onondaga	448	116
Ontario	6,998	3,289
Orange	954	435
Orleans	25,233	23,125
Oswego	557	77
Otsego	32	.....
Putnam	485	201
Queens	8	4
Rensselaer	297	70
Richmond	32	9
Rockland	697	252
St. Lawrence . . . . .	.....	.....
Saratoga	118	9
Schenectady	81	10
Schoharie	91	11
Schuyler	232	132
Seneca	1,391	554
Steuben	257	59
Suffolk	956	412
Sullivan	99	18
Tioga	35	4
Tompkins	461	166

QUINCES

1215

<i>County</i>	<i>Trees</i>	<i>Bushels</i>
Ulster	3,277	320
Warren	6	2
Washington	58	6
Wayne	14,119	11,244
Westchester	1,178	479
Wyoming	1,211	179
Yates	2,754	1,437
The State	169,031	132,451

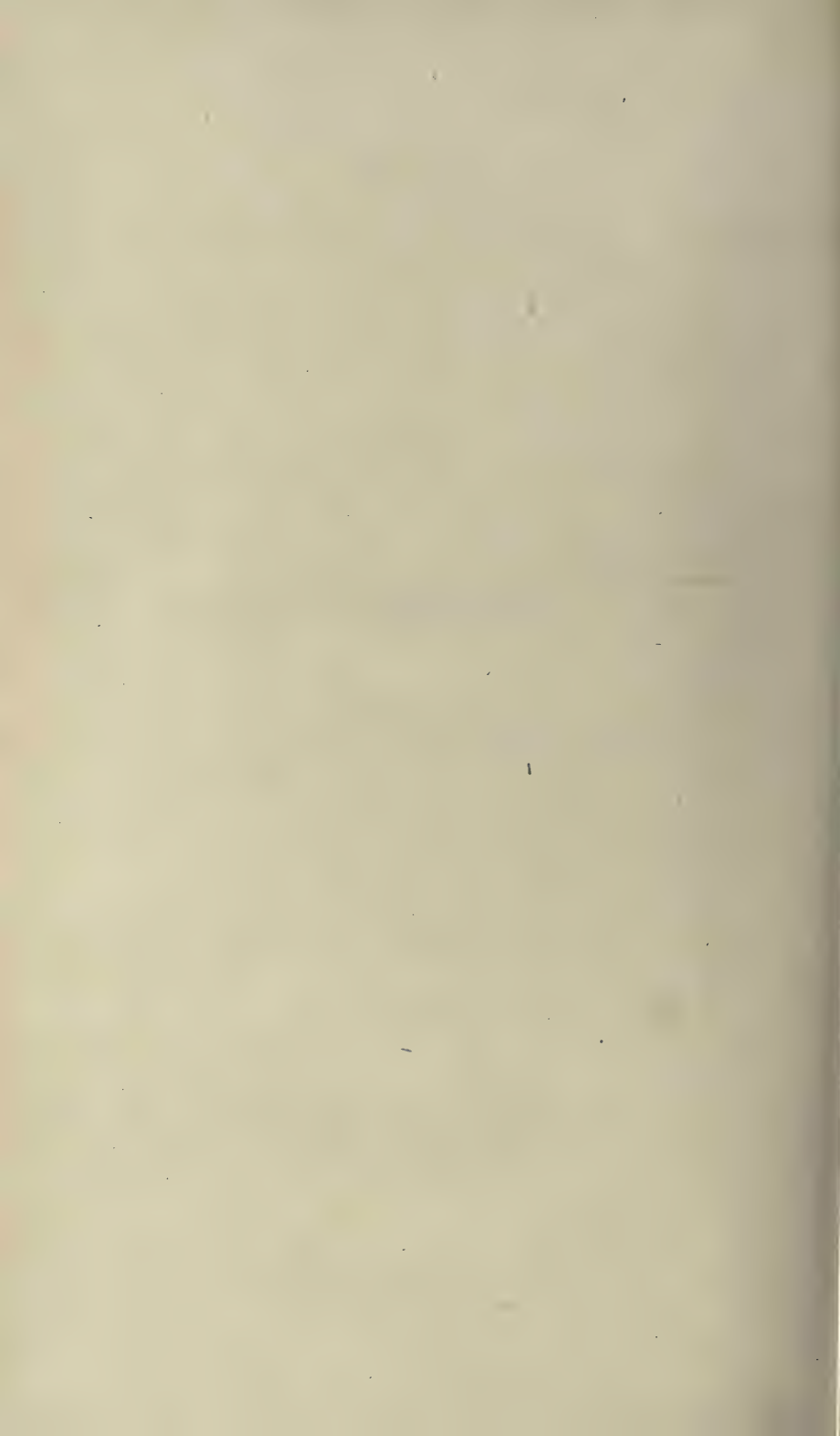


THE GRAPE

*"I draw the blood from out the earth;
I store the sun for winter mirth."*

WILLIAM MORRIS

[1217]





CONCORD

A LOOK BACKWARD ON THE GRAPE

L. H. BAILEY, LL.D., ITHACA, N. Y.

EARLY LITERATURE



On a shelf in my library are some fifty books printed in North America which are devoted to the grape, but there is no other fruit that has anywhere near this number of volumes. When, many years ago, I began to collect horticultural books from antiquarian shops in all parts of the country, with no lists to guide me, I was struck by the profusion of writings on "the vine" and began to make inquiry as to the reasons for it. I found that therein lay a most interesting and devious history, and one that has much significance to the development of agricultural prac-

tice. We think of history as belonging to politics and governments, to kings and thrones and wars, but hardly to such common practices as the plowing of land and the growing of grapes; yet, one does not plow, neither does he plant, until he makes up his mind to do so, and he makes up his mind because there are antecedent reasons.

These grape books are generally old — of the middle of last century and earlier — and they impress one greatly with the description of European practice. Many of them are books recording the attempt to transfer Old World methods into this new continent, and to grow the vine for the purpose of making wine; for wine has been the destiny of the grape from the time of Noah until the present epoch.

THE FRUIT OF THE VINE

In this country the apple was at first grown purposely for cider; early in last century, it is recorded, every man in New

Hampshire had his orchard and every tenth man his cider mill, and every well-to-do farmer put into his cellar yearly from twenty to fifty barrels of cider, which was all drunk on the premises. In 1805, there were 4,800 barrels of cider made in one town and every drop of it was drunk there. In Connecticut, according to Hale, every farmhouse cellar wintered from thirty to fifty barrels of cider. I should say to my reader that these practices are not evidences of desire for strong drink, but this was considered to be the proper and best way in which to consume the fruit; the grape was even more prized for its juice, and one of the earliest writers on this fruit in North America declares that he undertook the cultivation of it "for the good of my country and from a principle of love to mankind," considering wine to be a good corrective against the "great excesses in the use of distilled spirituous liquors" on the part of the people of America, "which ruin their constitutions, and soon render them unfit for the service of God and their country, as well as for that of their own family and friends." I have said this much about the use of the juices in order that my reader may understand the point in view in the early attempts to grow the vine in this country of promise.

THE GRAPE A FACTOR IN MAN'S DEVELOPMENT

The grape of history is the wine grape. Like the dog, the ox, the sheep, the grains for bread, the olive, and the apple, it has been one of the accompaniments of man from the depths of the immemorial past. It has modified his course and identified him with the products of the earth. In this long companionship, the details and the course of which no man knows, the vine has become modified into many forms, yielding its gracious products under many suns and in great diversity of difficult conditions. The dim memories of unknown generations were associations with wine, the product of the vine.

The Old World civilization was transferred to the New World, and the vine came with it, as came also cattle (albeit the native bison was here, but he has been exterminated), horses, fowls, rye, barley, and wheat. But, whereas these other good products adapted themselves readily to the new country, the grape did not do so; and in the full process of time another grape took the place of the old,

yielding a different fruit and being a table grape rather than a wine grape, although wine is made from it. Thus it comes that my grape books express the old history; and in the last half century, when grape growing in eastern North America has established itself and needs no explanation or justification, the books written about it have not been many.

THE PASSING OF THE WINE GRAPE

Let us remember, then, that the grape of history is one thing — *Vitis vinifera*, the “wine-bearing” vitis or grape,— and that it was early introduced into this country, and that the grape of New York is another thing. The earliest settlers brought the wine grape; companies were formed to grow it. The colonial history is replete with mention of it. My shelf of suggestive books led me into this history a quarter of a century ago; I wrote it nearly twenty years ago in my “Sketch of the Evolution of our Native Fruits”; and the field has since been further searched by Hedrick for the admirable great work, “The Grapes of New York.” It is not necessary, therefore, to present any of the details here, but only to explain in a general way how it came that the European grape failed and perished in our eastern country and how a native grape, offshoot of the vine of our woods, came to take its place unbeknown even to those who propagated it.

The very early plantings of the grape of the Old World were many, and often extensive. As early as 1662, Lord Baltimore planted 300 acres in Maryland. Colonies of vine-dressers specially brought from Europe for the purpose were established for the furtherance of vine culture. But although wine was made and even sent to Europe, everywhere a fatal and mysterious sickness finally overtook the vines, and they perished. This sickness was thought to be due to cold, to soil, to wrong exposure, to atmospheric causes, but still the hope persisted that somewhere the safe and ideal location would be found. Always was the effort made to find the right exposure and site, for somewhere nature must have provided the delicate balance of conditions that would make the vine to thrive.

This reminds us of our recent notions that very special places must be found if we are to grow Spitzenbergs and Newtown

Pippins, in contrast to the time before when we knew so little about the nature of the diseases and deficiencies that follow our crops. The sickness of these Old World grapes we now know to have been chiefly of two kinds — the phylloxera on the roots and the mildew and rot on the leaves and fruit. These diseases were unknown in the old countries whence came the vine. They are present on the wild vines of our woods and shores; yet long ago nature struck the balance, and they do not make much devastating headway against these native stocks with which the contest has been waged in the long and termless processes of time, but they attacked the newcomers with violence.

THE ADVENT AND EVOLUTION OF THE TABLE GRAPE

Among all the number of grapes that were tried by many patient and faithful experimenters, one finally persisted and gave promise. This was in the collections of the gifted Peter Legaux, at Philadelphia, a man of rare qualities and enthusiasm, but who died broken-spirited because of the failure of his vine-growing enterprise. A sad and yet a prophetic history will some day be written of the men who failed and were humiliated in the attempt to grow the vine in this western world.

This one grape that best persisted was supposed to have come from the region of the Cape of Good Hope, but in reality it was an offshoot of the wild native fox grape. How it came or why, we do not know, but it spread gradually; after a time the Catawba found its way into cultivation from the back lands of the Carolinas; the Isabella came, and American grape growing began on a new basis. By the middle of the last century these American grapes had well established themselves in parts of New York State, but new methods had to be developed, markets were to be found, diseases and difficulties with the improved varieties had to be overcome. Men still gave their lives to the work of grape development, but in a new way — men like E. S. Rogers, George Haskell, Jacob Moore, T. V. Munson, and others. New methods of training must be devised, and this, for its fulfillment, awaited the perfecting of means of manufacturing trellis wire. In California the Old World wine grape is grown to perfection, but in this eastern region we build our enterprise on the ameliorated offspring of the grapes that grew wild in the country when it was discovered.



FIG. 401.—THE CATAWBA

The sufficient introduction to cultivation of the Cape grape, known also as the Alexander, was due very largely to the heroic efforts of the Kentucky Vineyard Society, under the leadership of John James Dufour. As a lad in Switzerland he had conceived the idea that America offered a promising field in which to engage in wine-making with profit. The project of a great vine commune was talked over in the family circle in the old land, and in March, 1796, Dufour set off for the New World. For his passage he paid \$50 and baggage charges. On the brig "Sally" he landed in Philadelphia, August 12, having sailed June 10. For two or three years he visited all the leading vineyards in the new country. Of all the vines which Dufour saw, none sufficed "to pay for one-half of their attendance," save the "vines planted in the gardens of New York and Philadelphia, and about a dozen plants in the vineyard of Mr. Legaux." And from these few plants belonging to Legaux, under Dufour's care, began the most important experiment in American grape culture.

COMMUNITY EFFORT A CENTURY AGO

Dufour was now ready to locate land and to establish the proposed grape colony. He chose a location in the Great Bend of the Kentucky River, about twenty-five miles from Lexington by the present pikes, and thirteen miles from the present village of Nicholasville. The "Kentucky Vineyard Society" appears to have been established under his inspiration. The association was organized with \$10,000 capital. There were 200 shares at \$50 each, and forty shares were given Dufour as "salary to conduct the business, until it should become productive." The full number of shares was not taken, and the concern set out in the spring of 1799 with five acres planted to thirty-five varieties, many or most of which were secured from Legaux.

The enterprise being now fully on its feet, the remaining members of the Dufour family were ready to join. On New Year's Day, 1801, the adventurers came together in Switzerland, and prepared to take leave of home and country. Seventeen souls set sail in early spring upon a voyage which lasted 100 days. They landed in Norfolk during May. In this company were the seven remaining Dufours, Jean Daniel Mererod (who, either in Europe



FIG. 402.—THE CONCORD (Reduced)

or America, married Antoinette Dufour), Francis Louis de Siebenthal, John Francis de Sibenthal and Philip Bettens, together with women and children. They crossed the Alleghanies to Pittsburg with wagons, the women and children who could not walk going as freight at so much a hundred pounds. At Pittsburg, the colonists took boats on the Ohio, and set their faces towards that wild and rugged country which had been so recently the theatre of Daniel Boone's adventures. The party arrived at the vineyard, July 6, 1801. There the colonists, fresh from the snug and well tilled fields of Switzerland, saw a raw river bottom, rolling gradually up to rocky and wooded hills, which slope away to the south and southeast, and upon which the new vineyard was growing. In the foreground was a log cabin. But they were full of hope, and fell to work with much good will. The brothers had brought grape vines from home, and these, with loving solicitude, were planted with the vines which had been procured by the founder.

For years they labored, but finally the enterprise fell apart; later they gave it up, and little now remains to mark the place. Undaunted, a second experiment was undertaken by the Dufours, this time on the Ohio at Vevay, Indiana. Congress passed an act authorizing them to choose four sections of land on a credit of twelve years, "to plant the vine and make their principal business its cultivation." But the vines in the new place also took sick and would not bear; or if they bore, the fruit rotted before it was ready for the harvest. Only the Cape grape gave any important return. In May, 1832 or 1833, a killing frost ruined most of the remaining vineyards; and the Catawba, which was then coming into prominence, was set in the place of the old varieties.

FRUITION

Twenty years ago I visited the old place and uncovered much of the history. I was shown an old stock that tradition said was the sole remainder of the Cape grape; but its fruit was that of the Catawba, showing that the old kind has perished utterly. With Longworth at Cincinnati and others elsewhere, the Catawba gained in popularity; other varieties originated here and there

until the lists became attractive; finally Ephraim Bull, of Massachusetts, originated the Concord, and grape culture on an American foundation was assured.

The history is extensive and it can be only suggested here. It is replete with high enthusiasm, courage, large enterprises for the days in which they were made and even for our day, with hopes blasted and ambitions deferred. We reap the results, securely and confidently planting our vines and gathering their harvest; and our thankfulness is not alone to the earth which gives us of its bounty, but to the many hopeful and diligent souls who in times long past have contributed to our heritage.

VARIETIES OF GRAPES

U. P. HEDRICK

Horticulturist, New York Agricultural Experiment Station, Geneva, N. Y.

In their wild state, grapes are adapted to a great diversity of soils and conditions; under cultivation, varieties are confined to very restricted regions and even localities. Thus a grape will often succeed on one shore of a lake or river and not on the other; on one slope of a hill and not on the other. It is difficult to point out the determinants of grape adaptabilities; for the most part they can be known only by trial, since neither conditions of soil, of climate, nor lay of the land seem to determine with certainty the adaptability of any variety to a given locality. Many varieties reach perfection in one region or locality but not in another, although the conditions may seem to be very similar. Often the influence of local environments is so great that a variety grown in one locality may not be recognized as the same grape when produced under other conditions.

What has been said makes it plain that in a state as large as New York, and in one with its varied soil and climate conditions, a considerable number of grapes must be grown if house and markets are to be supplied. The following sorts, discussed alphabetically, form the very briefest list of grapes for this state.

BRIGHTON

Brighton ranks as one of the leading amateur grapes in New York and is among the ten or twelve chief commercial sorts in the state. Its good points are: high quality, handsome appearance, certainty of ripening, being earlier than Concord, vigorous growth, productiveness, adaptability to various soils, and ability to withstand fungi. Brighton has two serious defects which keep it from ranking high commercially: It deteriorates in quality very quickly after maturing, and is self sterile to a marked degree. To have it at its best the fruit should be thinned. After Catawba and Delaware it is probably more extensively grown than is any other red grape.



FIG. 403.—THE BRIGHTON

CATAWBA

Catawba is the standard red grape in the markets. Of all commercial grapes it is the best keeper, lasting until March or later. Because of its fine quality it often brings a higher price than do other varieties. The vine is vigorous, hardy, and productive, but the foliage and fruit are susceptible to fungi; this constitutes the chief defect of the variety. Because of the fact that it is very late in ripening, it can be grown profitably in New York only in the favored parts in the central lakes region and on the highlands surrounding the lakes.

CLINTON

Clinton is of value because of the vigor, hardiness, and fruitfulness of the vines. The vine is so vigorous that its growth is rank. Because of this and its straggling habit it is very difficult to keep under control, and in most situations needs a great deal of room. The fruit is too small and sour for a dessert grape; it is therefore valuable only for culinary purposes and for wine.

CONCORD

Concord is the most widely grown of the grapes of this continent. Its preeminently meritorious character is that it succeeds in a great number of soils and under great variations in climate. The second character which commends it is its high degree of fruitfulness; it gives large crops year in and year out. Added to the above points of superiority are hardiness, ability to withstand diseases and insects, comparative earliness, fair size of bunch and berry, and attractive color. Its faults are, that the quality is not high, the skins and the seeds are objectionable, and the grapes do not keep nor ship as well as could be desired. It is safe to say that in no part of New York should either home or commercial plantations be set in which Concord is not included.

DELAWARE

Delaware is the standard in quality among grapes. Added to high quality it withstands climatic conditions to which all but the most hardy succumb, and is well adapted to many soils and conditions. After the Concord, possibly, it is the most popular grape in

New York for garden, vineyard, and wine press. Besides the qualities named, Delaware matures sufficiently early to make its crops certain, is attractive in appearance, keeps well on the vine and in the package, and ships well. Its faults are: small size of the vine, slowness of growth, susceptibility to mildew, and the small size of the berries. It succeeds best in deep, rich, well-drained, warm soils, and must have good cultivation and close pruning. At least every home vineyard should include the Delaware; under many conditions it will prove profitable in commercial plantations.

DIAMOND

Diamond is surpassed in quality and beauty by no other green grape. When to its desirable fruit characters are added earliness, hardiness, productiveness, and vigor, it may be said that it is one of the best of the green grapes. For the amateur it has few superiors. The chief drawback for the small garden is that the robins prefer it to other varieties and greatly reduce the crop. It can be grown in any part of New York where the Concord succeeds.

DIANA

Diana is a seedling of Catawba, which it resembles, differing chiefly in having a lighter color and in being less pulpy and more juicy. It is, also, more delicate in flavor. One point of superiority in Diana is that it ripens from ten days to two weeks earlier, making possible its culture in regions where the season is too short for Catawba. The defects of Diana are that the vines are tender, and during cold winters must be protected in many parts of New York; the grapes ripen unevenly; both berries and foliage are susceptible to fungi; it is a shy bearer in many localities. In favorable situations, however, Diana is a very satisfactory grape for the amateur, and, where it does especially well, proves profitable for the local market.

DUTCHESS

Dutchess is a variety for the amateur. It is grown because of its delicious flavor, handsome appearance, and its good keeping qualities. It should not be planted extensively in commercial vineyards, since the vine is tender to cold and capricious as to soils. Moreover the berries do not ripen evenly, and berries and foliage

are susceptible to fungi. Dutchess does not require a very rich soil nor close pruning. The bunches should be thinned, and should be picked as soon as ripe, since the grapes have a tendency to crack when over-ripe. The clusters are especially fine when bagged.

ECLIPSE

Eclipse is a seedling of Niagara and therefore a grandchild of Concord, which it resembles, differing chiefly in being earlier and of much better color. Unfortunately the berries and bunches are smaller than those of Concord. The vines are hardly surpassed by those of any other variety, being hardy, healthy, and productive. The ripened fruit hangs on the vines for a long time without deterioration and the grapes do not crack in wet weather. Eclipse ripens several days earlier than Concord and should make a splendid forerunner of that standard sort for either home or market.

IONA

In flavor Iona is a rare combination of sweetness and acidity — pure, delicate, and vinous. The flesh is transparent, melting, tender, and juicy; the seeds are few, small, and part readily from the flesh; the color is a peculiar dark-red wine with a tinge of amethyst; the bunch, at its best, is large, though rather loose. The fruit does not decay readily and may be kept in a good fruit room until late winter without loss of flavor and without the berries loosening from the bunch. The vine characters of Iona are not so good as those of the fruit. To do well it must have a soil exactly suited to its needs. Seemingly it does best in deep, dry, sandy, or gravelly clays. It cannot be grown in damp, rich, black soils nor in poor sands or gravels. It does especially well when trained against walls or buildings, attaining rare perfection under such conditions. It is doubtfully hardy and in many parts of the state must have winter protection. Few varieties are more satisfactory for the garden, and, in favored conditions, it is a good local market sort.

JEFFERSON

Jefferson is a seedling of Concord crossed with Iona. It resembles Concord in vigor, productiveness, and healthfulness, and Iona in color and quality of fruit. The crop ripens two weeks later

than Concord and the vines are not nearly so hardy — faults that debar it from taking high rank as a commercial grape in New York. Fortunately the vines yield readily to “laying down” for winter protection so that even in commercial plantations it is not difficult to protect them. The fruit of Jefferson is large, well-formed, compact, with berries of a uniform size and color, which, taken together, make it one of the most attractive of the red grapes. The flesh is firm, tender, and juicy, with a rich, vinous flavor and delicate aroma, which persists even after the berries have dried into raisins. The variety thrives in nearly all grape soils, and, with the characters we have named, ought to find a place in every home plantation.

LINDLEY

By common consent, Lindley is the best of the red grapes originated by Rogers in his crosses between the European and the American species. The bunches are of only medium size and are somewhat loose, but the berries are well formed, of uniform size, and of a most attractive dark-red color. The flesh is firm, fine-grained, juicy, and tender, and has a peculiarly rich, aromatic flavor. The fruit keeps well and ships well, and the berries neither crack nor shatter. The vine is vigorous, hardy, and healthy, but very susceptible to mildew. Lindley has long been a favorite grape for the garden and should continue to be such.

MOORE EARLY

Moore Early is the standard grape of its season in New York. It cannot be better described than as an early Concord. It comes in season from two to three weeks earlier than Concord, and the last fruits of it are sent to market before those of the latter grape are picked. The vines are readily recognizable from those of Concord, differing chiefly in being less productive and more precocious bearers. To grow the variety satisfactorily, the soil must be rich, well-drained, and loose, and must be frequently cultivated; the vines should be carefully pruned and cared for. The bunches of Moore Early are not so large as those of Concord and are more inclined to looseness. Sometimes the berries shell rather badly. Moore Early is by no means an ideal grape for its season, but until something better is introduced it will probably remain the best early commercial grape in New York.

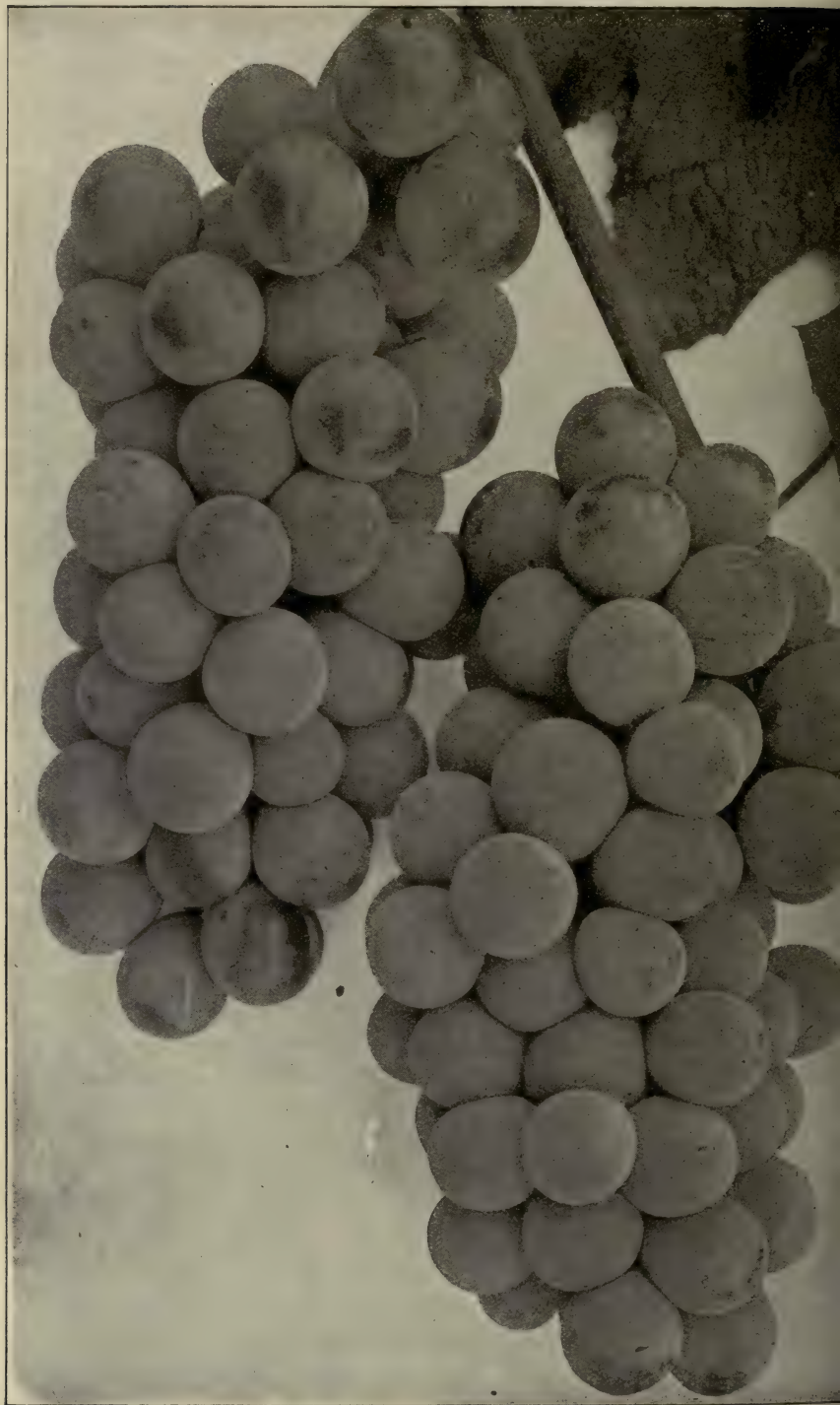


FIG. 404.—THE NIAGARA

NIAGARA

Niagara is the leading American green grape, holding the rank among grapes of this color that Concord holds among black varieties. It is, however, a less valuable sort than Concord, and it is doubtful whether it should be ranked much higher than several others of the green grapes with which it must compete. In hardiness of root and vine Niagara Falls somewhat short of Concord, and the variety cannot be relied on without winter protection where the thermometer falls much below zero. Both bunches and berries of Niagara are larger than those of Concord, and are better formed; the skin does not crack so easy as that of Concord; the fruit shells as badly, and does not keep much, if any longer; both vines and fruits of Niagara are more susceptible to fungous disease than are those of Concord. Despite its many defects, Niagara remains the leading commercial green grape for New York.

VERGENNES

Vergennes has the valuable attribute of seldom failing to bear a crop, making it a valuable sort in locations where other grapes are capricious in bearing. It ripens with Concord or a little later. The variety is unpopular with vineyardists because of the sprawling habit of the vines, making it rather unmanageable. The appearance of the fruit is attractive, and, while the quality is not high, it is good; the flavor is agreeable, the flesh is tender, and the seeds and skin are not objectionable. It is one of the best keeping grapes and may be found in the markets even as late as January or February. Vergennes is a grape above the ordinary and should be found in all parts of New York in both home and commercial plantations.

WINCHELL

Winchell is a very early variety and one of good quality — characters seldom found in combination in grapes. The vines are vigorous, hardy, healthy and productive, and the fruit keeps and ships well. Unfortunately the berries, and under some conditions the bunches, are small; this, combined with the fact that green grapes are not so popular as black or red ones, has kept Winchell from being as generally planted in New York as it otherwise



FIG. 405.—THE WORDEN

would have been. It is, however, a standard early green grape, and deserves to rank in home and commercial plantations as the best early grape of its color.

WORDEN

Worden is the best known and the most meritorious of all the numerous offspring of Concord. It differs chiefly from its parent in having larger berries and bunches, in being of better quality, and in ripening from a week to ten days earlier. It is equally hardy, healthy, vigorous, and productive. It is more fastidious in its adaptations of soils than is its parent. Its chief fault is that the fruit cracks easily, often preventing the profitable marketing of a crop. The pulp of Worden is softer than that of Concord, and it is juicier. Its keeping qualities are not so good, making it a less satisfactory variety to ship. It is a more desirable variety for the garden than its parent because of its higher quality; and, under conditions well suited to it, is better as a commercial variety, since it is handsomer and of better quality. In the markets it ought to sell for higher prices than Concord if desired for immediate consumption. In many markets Worden is sold as Concord and has the effect of extending the Concord season.*

* See "Grapes of New York" by Professor Hedrick, Published by State Agr. Exp. Sta., Geneva, N. Y.

GRAPE-GROWING SECTIONS OF NEW YORK

F. E. GLADWIN

Associate Horticulturist, Vineyard Laboratory of the New York Agricultural Experiment Station, Fredonia, N. Y.

The grape growing area of New York is divided into four principal regions with one or more rather limited outlying districts. In point of acreage they rank as follows: the Chautauqua belt, extending from the Pennsylvania state line on the west to Derby on the east; the Central Lakes region, which includes the territory about Canandaigua, Cayuga, Keuka, and Seneca lakes and the nearby area about Naples; the Hudson Valley, and the Lake Ontario district, extending from the Niagara River east through Wayne County. A limited area about Fayetteville produces grapes in commercial quantities.

CONCORD

The Chautauqua and Erie belt is essentially a Concord area, as probably ninety-five per cent of all vines are of that variety. Seldom has a variety of any fruit been adopted so generally as the Concord grape in this district. Such extensive planting does not necessarily imply that other varieties could not be more profitably grown in many instances, where special types and conditions of soil occur. It seems to have been a case of "follow the leader." That the Concord is quite adaptable to many varieties of soils, and that it is tolerant of considerable extremes in its moisture requirements, is proved over and over again in practice throughout the belt. That there does exist the best Concord soil cannot be doubted, but the areas of such are rather limited.

The principal factor that makes the Concord grape the undisputed leader among varieties, not only for the Chautauqua district but for the entire eastern United States, is its elasticity in the matter of soils. In connection with its wide range of soil and climate adaptability, it is the foremost because of its ability to stand the average winter temperatures of New York. This important characteristic is dependent in a large measure upon the fact that this variety is a midseason one, and, except under

very unfavorable conditions of climate, ripens its wood and buds before severe winter temperatures occur. Hardiness, then, is a second feature which accounts for its popularity. With other fruits there are the annual and the biennial bearers. Generally speaking, the grape does not present these characters in so marked a degree, yet certain varieties approach the biennial bearing habit. The Concord, however, under good cultural conditions produces satisfactory annual crops. To have commercial standing, any variety must return a good annual tonnage.

The public has been educated to the Concord type, and the black grape is favored by the public as is the red apple. Many black grapes are mistaken for Concord to those unfamiliar with the flavor of the full, ripe cluster of this variety. Worden, Moore, and even Isabella, are often sold on the city markets for Concord. Grape connoisseurs do not rate Concord of high quality, yet it is the most popular American grape. Its popularity is largely due to the fact that it does not cloy the appetite as do some varieties. Several clusters can be eaten by the average individual at one sitting, and as many more within a short time, without that feeling of fullness that comes from eating many of the other varieties. Concord is grown extensively, not alone in the Chautauqua belt, but in the Central Lakes region, where it is fast supplanting other varieties. In the Hudson Valley and the Niagara district it is not so popular, but even in these regions its planting is becoming more extensive.

CATAWBA

The Catawba is probably the second grape in point of acreage in New York. In the Chautauqua area it is very rarely grown, as it is reputed to mature its fruit so late as to meet with killing frosts. The real facts are, however, that the vineyardists of the section are Concord growers and they have not studied the Catawba characteristics as have the growers on Keuka Lake. Likewise, the latter do not grow the Concord so well as does the Chautauqua vineyardist. Each region is a specialized one. The principal reason why the Catawba has not been more successfully grown in the Chautauqua and Erie belt is found in the pruning and training of it. The Catawba would not be a success



FIG. 406.—MAP SHOWING LOCATION OF GRAPE DISTRICTS IN NEW YORK STATE

on Keuka Lake if it were trained as is the Concord in the Chautauqua and Erie belt. The Catawba, however, is more restricted in its adaptability to soils than is the Concord. It is more susceptible to fungous troubles, and it is less tolerant of wet feet than is the Concord. With average good care, the vine makes a vigorous growth and even under neglect continues to produce a fair crop.

Its cluster characteristics are superior to Concord in point of size, shape, and compactness. However, Concord is the higher producer, even under like conditions of soil, climate, and care. Catawba is superior to Concord in its keeping qualities, frequently being held in storage till late in January. It hangs to the vine well before picking, even after the leaves have practically all dropped. It is used in large quantities in the making of the sweet and dry Catawba wines of the Keuka Lake district. As a dessert grape it is very popular in many localities, especially when fully ripened. It is not the equal of Concord in the manufacture of unfermented grape juice, but there are possibilities unexplored in combining the juice of Catawba with other varieties for this purpose. Catawba may be classed as the leading red grape of New York.

NIAGARA

This variety is at the present time the leading white grape of the state. In quality it is not the equal either of the Concord or the Catawba; neither is it adapted to so diverse soil conditions. The Lake Ontario plain is preeminently the Niagara section of the state. A second but less important area for this variety lies between Seneca and Cayuga lakes of the Central Lakes region. A few vineyards of the variety are found in the Chautauqua district and still fewer in the Hudson Valley. When fully ripe it is a very showy grape, and for those who prefer the foxy taste characteristic of most varieties of the *Labrusca* species, Niagara furnishes it in unadulterated form. Too often Niagara is shipped before it is fit for dessert purposes. This variety is particularly weak in root, and many vines are killed annually through freezing. It does not mature its wood so well as Concord, and many buds are injured by winter temperature. In regions where black rot is prevalent, Niagara is quite often badly

affected. Under favorable conditions of soil and climate, the vine makes a very satisfactory growth. Very often Niagara matures a heavy crop at the expense of the succeeding one. Its season is practically that of Concord. Other and better white grapes are grown in New York, but none reach the commercial importance of this variety.

DELAWARE

Delaware is the American grape of quality, and in New York it probably ranks third in commercial importance. It is so elastic in its soil requirements that it is adapted to many types, and endures great climatic extremes. It matures its fruit early enough to escape killing frosts, and is particularly resistant to winter temperatures. It is attractive in appearance and ships well. The cluster is very compact, shouldered and of beautiful light red color. Delaware is very productive, but lacks vigor. It is fairly immune to black rot, but is susceptible to both powdery and downy mildew. Its chief faults are the small size of the vine, slowness of growth and the small size of the berries. It requires close pruning, good cultivation, and liberal fertilization.

It is the leading dessert grape of New York. It is used extensively for blending in the manufacture of champagne and in making Delaware wines. In New York the variety is grown most extensively about the shores of Keuka Lake, both for wine making and for table use. The Hudson Valley probably ranks second in the growing of this grape.

At the present time, Delaware is not nearly so profitable commercially as in former years. The small size of the vine and fruit clusters necessitates a much higher market price in order to get the same returns as from an acre of Concord or Catawba. The growing of Delaware is on the wane, in New York. Where its quality is appreciated and the corresponding market price is sufficient to equalize the lessened tonnage, it still ought to prove a profitable grape. It certainly should have a place in every home garden.

WORDEN

Worden, the best black offspring of Concord, probably ranks fourth in importance in the grape growing of New York. It differs chiefly from Concord in having larger berries and clusters, in possessing better quality, and being from a week to ten days earlier. It is equally hardy and productive with Concord, but its vigor falls somewhat short of that variety. It is more particular in its choice of soils than is its parent. Its chief defect consists in tenderness of skin, which, during wet maturing seasons, frequently cracks and deterioration follows. A second defect of the variety is in the small green berries often found on the cluster at maturity, necessitating the removal of all such at the packing table. A third fault, in many seasons, is the failure to mature evenly. Two or three pickings are required in order to harvest the fruit at its best. The first picking always produces the most satisfactory fruit for packing, for often no further ripening takes place after this period, at least in so far as coloring is concerned, although a slightly greater amount of sugar may be fixed when the fruit is allowed to hang a few days after the larger part of it is fit for market.

Worden cannot be put on distant markets at its best, but for local consumption and nearby shipments it is profitably grown in New York. While this variety is higher in quality than Concord, it is not so generally preferred by the average consumer, as it tends to cloy the appetite more than does the latter variety.

The Chautauqua and Hudson Valley districts lead in the production of Worden, comparatively few being grown in the Central Lakes and Niagara regions.

MOORE

Moore, or Moore Early, probably ranks fifth among the commercial varieties grown in New York. The greater percentage of this variety is grown in the Chautauqua and Erie belt. It is the standard black grape of its season for the state. It ripens from ten days to two weeks earlier than does the Concord. The vines are not so hardy nor so healthy as the latter, and they require certain soils for their best development. The pruning of Moore is a problem in itself. The clusters of this variety are not so large

as Concord, but the berries are considerably larger. The flavor, when fully ripened, is very similar to that of the variety last named, although the quality and texture of the flesh is inferior.

The character of the skin renders it a good grade for shipment to distant markets. Although vine and fruit characteristics are not ideal, this variety surpasses the other black grapes of its season, Champion and Hartford. Too often Moore is shipped before it is edible, and this has had a very deterrent effect on subsequent shipments. The most that can be said in its favor is that it is early.

OTHER VARIETIES

Besides the varieties already mentioned, many others are grown in the various grape sections of the state by reason of special uses and markets, or from special adaptability to the soils and climate of the particular section.

In addition to the varieties already cited as being grown in the Chautauqua belt, occasional small areas of Clinton, Champion, Ives, Isabella, and some of the Rogers hybrids are seen. These, as a rule, are not recent plantings, but rather those made when the growing of Concord was largely in its infancy. Of the varieties mentioned, Clinton is the only one that, to the writer's knowledge, has been planted within recent years. It is in demand for the making of red wines, and it probably will be used in future for blended, unfermented grape juices. Of the Rogers hybrids, Lindley and Agawam are the most common. In this belt the important varieties rank in the following order: Concord, Worden, Moore, Delaware, Niagara, Catawba, and Champion. This belt as a whole is slow to take up a new variety, even in an experimental way, but prefers to cling to the old established ones.

Of the Central Lakes region the Keuka Lake district furnishes the greatest number of varieties. In addition to Catawba, Concord, and Delaware, there are found growing in considerable numbers Isabella, Clinton, Ives, Diana, Elvira, Iona, Eumelan, Niagara, Worden, and Diamond. A large percentage, such as Delaware, Iona, Elvira, Eumelan, and Isabella, form the basis for champagne. Concord and Catawba are grown both for table use and for other wines, and Clinton is used extensively in the manufacture of red wines.

In the Naples district of the Central Lakes region, Concord is the leading variety. Here are also found several good-sized acreages of Duchess, a variety that is very much in demand by the wine makers of Keuka Lake, but which is very rare in that district.

The vineyards about Seneca and Cayuga lakes are largely Concord and Niagara. Near Interlaken there is growing a large acreage of Diamond. A few Elvira vineyards are to be found on the west shore. To a lesser degree, Delaware is also grown.

The Hudson valley has been the foremost of all the grape districts of New York in the testing out of the newer varieties. This may be accounted for in part by the fact that many varieties of American grapes have been originated in the region. At present Concord, Champion, Cottage, Clinton, Brighton, Bacchus, Delaware, Elvira, Empire State, Hartford, Moore, Martha, Niagara, Pocklington, Duchess, Worden, Wyoming, Ulster, and several of the Rogers hybrids, comprise nearly all the varieties that are grown for market.

In the Niagara district, the Niagara is the most commonly grown. This variety is followed in importance by Concord. Some few growers in the western end of the district are growing Campbell. In the vicinity of Irondequoit Bay, Concord, Niagara, Delaware, Ives, and Clinton are found growing. Most of the grapes in this area are either sold on the Rochester markets or used in wine making.

About Fayetteville are a few vineyards of considerable size. In these, a large number of varieties are growing. This region is particularly subject to severe winter temperatures, so that in order to grow grapes successfully the vines must be given winter protection by laying down and covering. Even with this added expense, a few in the locality have found grape growing profitable.

Grape growing in New York is one of the successful fruit industries largely because of natural topographic situations, which in turn have influenced the climatic conditions of the grape districts; but not the least important factor in making New York the leader in the growing of American grapes is the large number of meritorious varieties from which to choose, according to their fitness for the various localities.

THE NEW YORK WINE INDUSTRY

LEE J. VANCE

Editor, *American Wine Press*, New York



The average New Yorker is not so well posted as he should be on the great extent, the value, and the importance of the wine industry of the Empire State.

Many people know in a general way of New York wines and champagnes. But it is not until they have visited the large wine making establishments that they fully realize that the New York wine industry is one of the big assets of the state. In other words, the wine industry of New York gives employment to many thousand people; it represents many millions of dollars of invested capital, and it brings annually large returns, as well as fame and reputation to the vintages of the state.



FIG. 407.—GRAPE HARVEST IN THE LAKE KEUKA DISTRICT

It may not be generally known that New York stands first in the production of sparkling wines or champagnes. Such is the

[1246]

fact. This state produces about two-thirds of all the champagne made in the United States. Only one state, California, exceeds New York in the production of dry, or still, wines.

According to the most recent estimates, there are some 62,000 vineyards in New York State. The average yield is from one and one-half to two tons of grapes per acre. Of this yield about one-half, or from 60,000 to 65,000 tons, is used for the making of wines and grape juice.

Few, if any, states are better located or better adapted for grape growing and wine making than New York. In the matter of location alone, the New York grape and wine producers have a distinct advantage. For one thing, they have rather near at hand all the large eastern cities — the largest and best markets in the United States. Thus the New York wine makers are 3,000 miles nearer to the greatest consuming centers of the country than the California producers, their largest competitors.

As to adaptation for viticulture, New York has such a diversity of climatic conditions and soils that grape culture has been successfully carried on for the past fifty years over a large area of the state. In certain sections, the climate conditions and soil compare most favorably with some of the renowned vineyard districts of Europe, such as are found in France, Germany, and Northern Italy. Indeed, the Keuka Lake region is known as "the American champagne district." It is on the same isothermal line as the champagne district of France, and the natural conditions, together with the character and quality of certain varieties of grapes, are just right for producing sparkling wine of true champagne type.

More champagne is made in this district than in all of the other sections of the United States. New York champagnes have made the state famous, for they are known and sold over the whole country from the Atlantic to the Pacific Coast. The leading brands of New York champagne now rival in the open market those from the French district. Although the New York wine industry is comparatively young, our wine makers have been making steady progress, and their wines and champagnes are equal in purity and quality to the foreign wines of similar type and character.

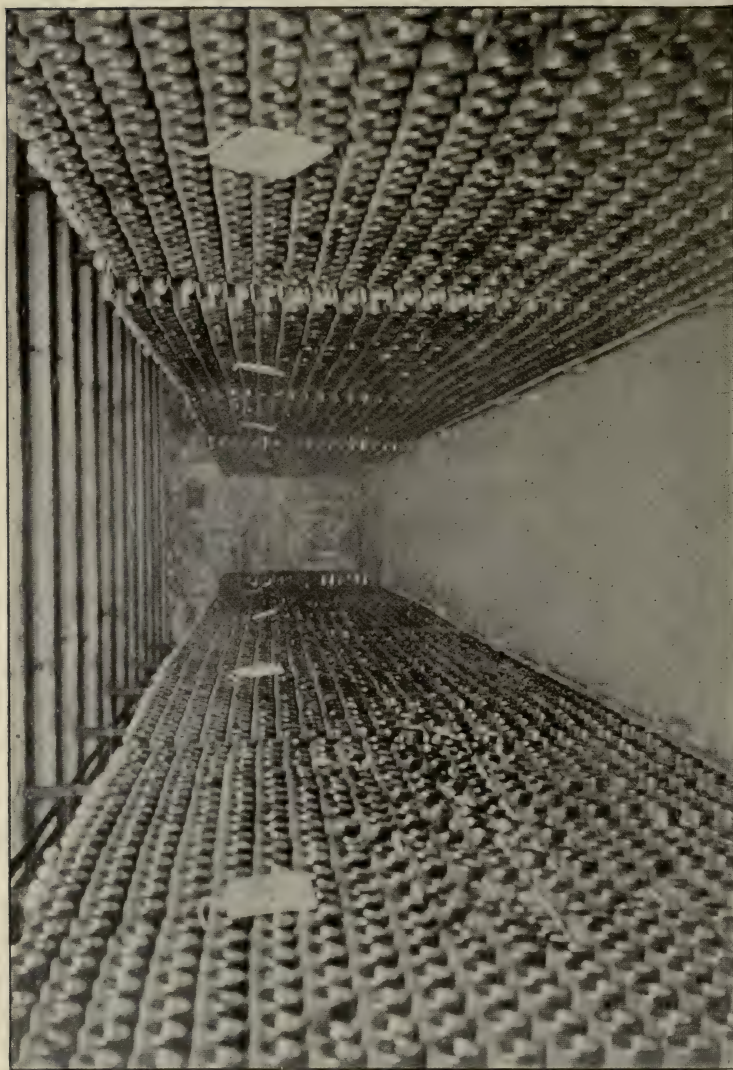


FIG. 408.—CHAMPAGNE IN BOTTLES, MATURING IN THE DEEP, COOL UNDERGROUND VAULTS. (PLEASANT VALLEY WINE CO.)

During the past ten years, it is estimated that the manufacture of still wines in New York State has increased about 25 per cent, and that of champagnes about 50 per cent. In 1904, the output was about 2,600,000 gallons of dry and sweet wines, and about 1,250,000 bottles of champagne. The yield of 1914 was about 3,250,000 gallons of dry and sweet wines, and about 1,750,000 bottles of champagne. Of course the vintage, or output of wine, depending as it does upon the grape yield, will vary greatly from year to year. This year (1915) the production of wines in New York will be below the average, owing to the decrease in the size of the grape crop in the state.

FOUR WINE-MAKING DISTRICTS

The New York wine industry is distributed in four large grape-growing sections, as follows: (1) the Hudson River district, (2) the Central Lakes region, (3) the Chautauqua district, and (4) the Niagara district.

The Hudson River district includes the counties of Orange, Ulster and Dutchess as well as the southern part of Columbia, with a total of about 5,000 acres of vineyard. There are several wine cellars in this district, among the largest and most important being that of the Brotherhood Wine Company at Washingtonville, Orange County. Here, as far back as 1837-38, a French vintner, John Jacques, set out a small vineyard, in which some of the original vines are still growing. A few years later wine was made, and the old Jacques cellar forms a small part of the large establishment of the present wine company.

The Central Lakes region comprises some 17,000 acres of vineyards about Keuka, Canandaigua and Seneca lakes in western New York. The headquarters of the wine industry are about Hammondsport at the head of Lake Keuka. Here, within a radius of half a dozen miles, are located a number of the largest wineries in the state. The wine industry in this district dates from 1860, when the Pleasant Valley Wine Company was formed, and its cellars were established at Rheims, a few miles from Hammondsport. Five years later the Urbana Wine Company was organized and a cellar built at Urbana, four miles below Hammondsport on the banks of Lake Keuka.

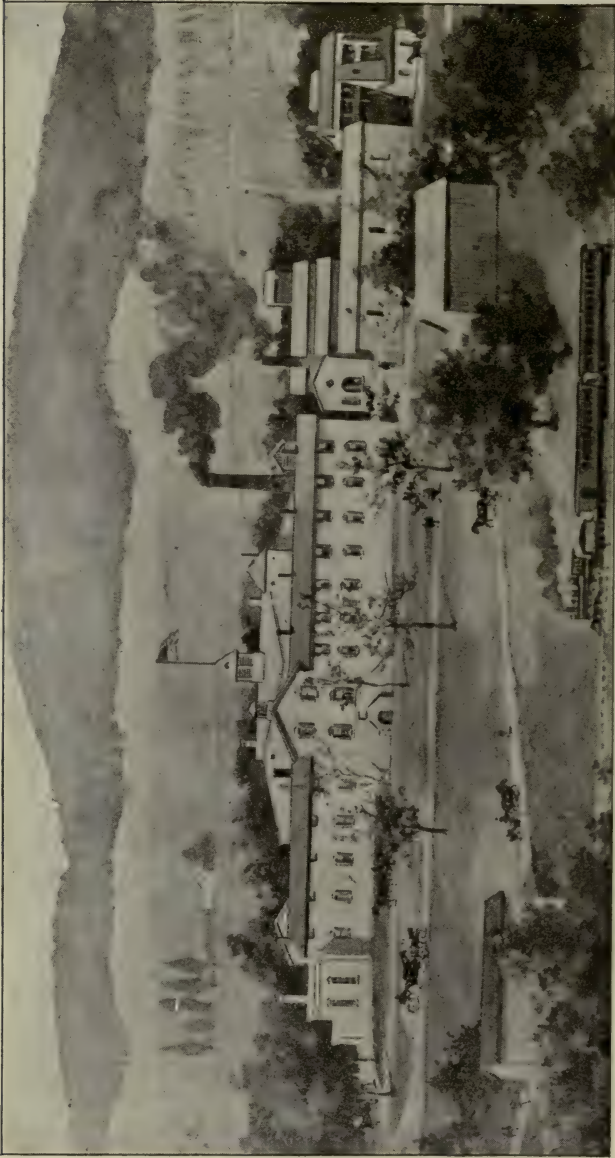


FIG. 409.—FRONT VIEW OF PLANT OF PLEASANT VALLEY WINE CO., RHEIMS, N. Y.

The Chautauqua district includes the wine industry in a grape belt of some 30,000 acres, which extends from Erie County to the Pennsylvania line along the southeastern shore of Lake Erie for a distance of about 50 miles. It is the largest single, continuous stretch of vineyards in the United States. The wine industry in this district was started in 1859, when the Ryckman cellar was built at Brocton. In the sixties and seventies other wineries were established, and for a number of years, or up to 1884, they took most of the grape crop. Then came a grape boom, and the planting of vineyards in the Chautauqua district increased by leaps and bounds. The great bulk of the crop was of the Concord variety, which, although it did not make a high-grade wine, was in growing demand for table purposes and for grape juice. This, together with the flooding of the markets with cheap California wines, gave the wine industry of the district a setback from which it has not yet recovered.

The Niagara district includes the industry in Erie, Niagara and Monroe counties with a total of about 3,800 acres of vineyards. There are several wine cellars in this district; they use grapes from their own and other districts. In fact, large quantities of grapes from the different districts in New York are shipped each season to wine makers in the large cities and to wineries outside of the state.

VARIETIES OF GRAPES USED FOR MAKING WINES

Professor U. P. Hedrick in his monumental work, "The Grapes of New York," has given a very complete account of all of the important varieties of American grapes and of the different grape-growing districts in this state. Those who desire a full description of varieties should read Professor Hedrick's work, which is a mine of information.*

Native Grapes

New York wines are made from the native, or American, grapes. Although there are several hundred varieties, only some sixteen

* The "Grapes of New York," by U. P. Hedrick, Horticulturist, New York Agricultural Experiment Station. See also article by F. E. Gladwin, page 1238.

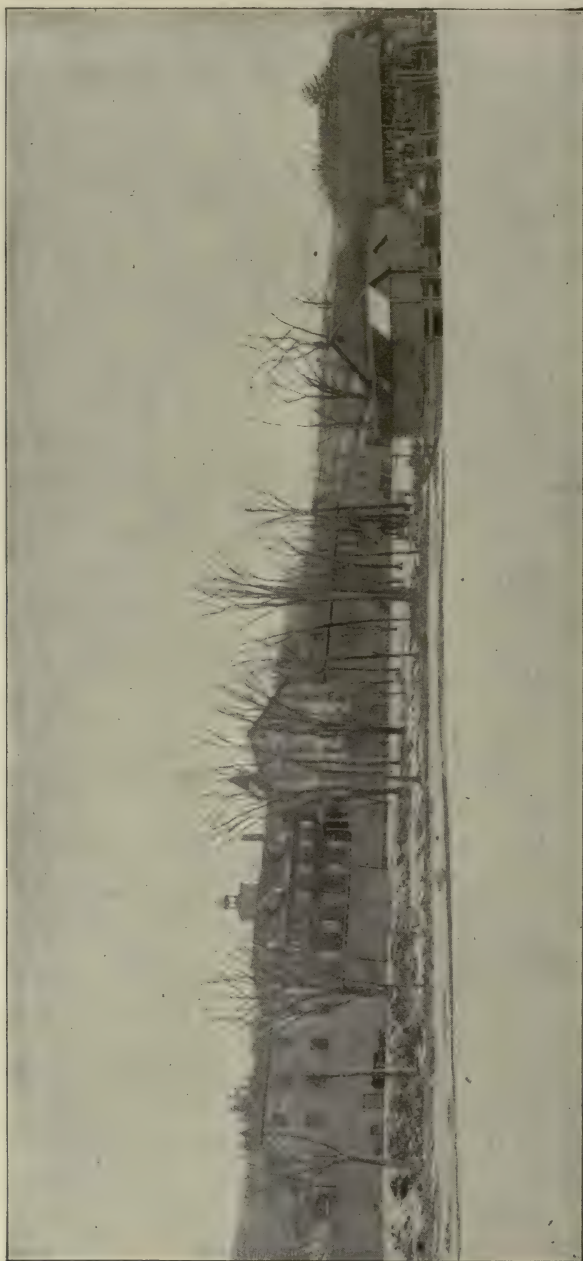


FIG. 410.—URBANA WINE COMPANY'S CELLARS. (FRONT VIEW FROM LAKE KEUKA.)

or eighteen kinds are used to any extent by the wine makers. In fact, the great bulk of the New York grape crop is limited to only three varieties — Concord, Catawba, and Delaware.

Foreign Grapes

Thus far, efforts to establish vineyards of *Vitis vinifera*, or European grapes, in New York and other eastern states have not met with success. However, tests now being made at the Geneva Experiment Station go to show that European grapes will grow and flourish in New York State, and those growing there are as vigorous and thrifty as the native vines.

If vineyards of European grapes should be established in New York, it would revolutionize the wine industry; for they would supply our wine makers with an entirely new variety of grape, which would enable them to produce wines of a type and character very similar to the foreign kinds.

The following is a list of wines and the varieties of grapes now used in making them:

Red dry wines (Claret and Burgundy types) — Ives, Clinton, Concorn, Eumeland, and the like.

White dry wines (Rhine and Sauterne types) — Catawba, Delaware, Iona, and the like.

Sparkling wines (Champagnes) — Delaware, Catawba, Dutchess, Diana, Elvira, Bacchus, Diamond, and the like.

For red dry wines, Ives, Clinton and Concord are in demand, as they give a bright ruby color, fine body, and fruity flavor.

For white dry wines, the grapes most suitable are the Catawba, Delaware, and Iona. A dry Catawba wine resembles in style a German hock or Rhine wine, although it has other characteristics of its own. Fine wines of the dry Sauterne and Graves types are made from the Delaware, which is rightly regarded as one of the choicest American grapes. Iona produces a splendid white wine, which, when carefully made and fully matured, has a sweetness and fragrance similar to that which is found in the best French Sauternes.

For sparkling wines, or champagnes, a large proportion of Delaware and Catawba is used in combination with the juices from other grapes, the whole forming what is called the "blend,"



or cuvée. All champagne, whether made in this country or in France, is the result of a mixture of different grape juices. Thus certain varieties of grapes have the right body, acidity, or neutral flavor, while other varieties give the vivacity, sparkle, and *mousse*, which are so greatly desired.

In brief, the correct blending of wines is one of the most important factors in the art of wine making. The practice is based upon the differences between wines, so that the mixing together of different kinds or qualities of wines will yield a better product than any one of the wines that go into the blend. There is no doubt that the proper blending of eastern wines with each other and with California wines give good results, both for the wine maker and for the consumer.

THE WINE MAKING SEASON

The term "vintage" is used to cover the wine-making season, and it includes (1) gathering of the grapes, (2) crushing, pressing, and fermentation and (3) the general cellar operations connected with the handling and care of the "must," or new wine.

The Grape Harvest

In New York the vintage begins early in September and continues until the last of October. It depends, of course, upon the variety of grapes, the weather conditions during the growing season, and the location of the vineyards. Different varieties of grapes ripen at different times in the different districts, and they ripen at different times in the same district. As a rule, the vintage in the Hudson River Valley is from a week to ten days earlier than it is in the western New York districts.

Many of the wineries have vineyards of their own, but all of them purchase large quantities of grapes from numerous small growers. Both before and during the grape harvest, representatives of the wine cellars usually make contracts for a certain number of tons of grapes at a certain price per ton.

The price paid for grapes is mostly a matter of supply and demand, but there is always a demand for the best wine grapes. The highest prices are paid for grapes which are used for making

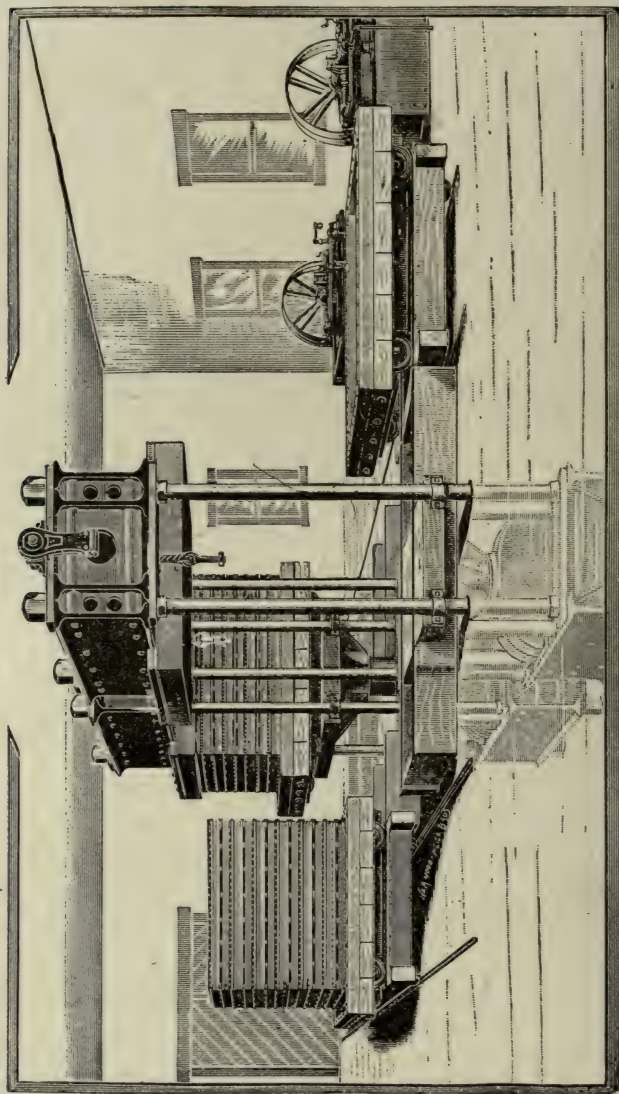


FIG. 412.—IMPROVED HYDRAULIC WINE PRESS, SHOWING DOWNWARD PRESSURE AND TRANSFER CAR SYSTEM

champagne, such as the Delaware, Catawba, Elvira, Bacchus, and Diamond. Even when the Delaware and Catawba crops have been large, the average price has been from \$45 to \$50 per ton. In some years Delawares sell for wine-making purposes as high as \$75 per ton, and Catawbas for \$65 per ton.

The yield of Elvira, Diamond, Bacchus, Eumelan, Iona, and other choice varieties for wine making is not large. Hence they usually bring a good price — from \$65 to \$75 per ton. The lowest prices are paid for an ordinary variety, such as Concord. Of late years, owing to the bidding by the large grape-juice manufacturers, the price for Concords has averaged very high; that is, about \$30 per ton. In 1914 the price for some Concords in the Chautauqua district was as high as \$50 and \$55 per ton. This year (1915) the average price of Concords will be much lower, probably not more than \$26 and \$28 per ton.

The figures above given for New York grapes are rather high when compared with the prices paid in California for different wine grapes. During the past few years grapes for making sweet wines, such as Muscats, have sold in California as low as \$6 and \$7 per ton, and seldom over \$10 and \$12 per ton; while grapes for dry wines, such as Zinfandel and Burger, have brought from \$14 to \$15 per ton, and the choicest varieties, such as Cabernet Sauvignon, Petite Sirah, Franken and Riesling, from \$22 to \$24 per ton.

Thus the New York wine makers are at a disadvantage in producing very cheap wines. But cheapness is not the only thing to be considered in the wine industry. As we have pointed out, the New York wine producers have the advantage of being close to the largest and best markets of the country. Their wines, being made from a different variety of grape, are different from California wines. The demand for New York wine is as much a matter of taste as of price, and they are sold on an average at a higher price than California wines. The people are willing to pay for the kind of wine they want and like. Every season the American people eat immense quantities of New York grapes; they like their flavor and aroma, and hence they appreciate the same qualities in the wines which are made from those grapes.

Gathering the Grapes

The time to gather the grapes for wine is when they have reached that stage of maturity known as "wine-making ripeness." This stage of ripeness is determined by means of a must-scale or saccharometer. As a rule, the careful wine maker takes a number of bunches of grapes and expresses the juice into a receptacle. He drops the must-scale into the juice and the sugar content will be indicated on the scale.

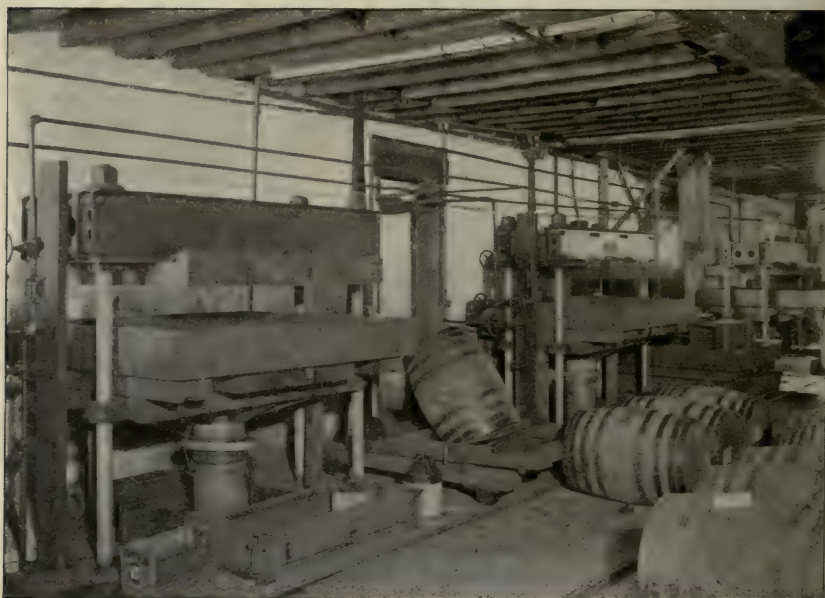


FIG. 413.—SECTION OF PRESS ROOM, SHOWING HYDRAULIC PRESSES

The grape crop is gathered in trays or boxes that hold from thirty to forty pounds. When filled they are carried to the end of the rows, where there is a driveway. Here the boxes are collected in wagons and drawn to the wine cellar or to the railroad station, where they are loaded on the cars.

Crushing and Stemming

When the grapes arrive at the winery they are first weighed; they are then carried by hand or by a conveyor and dumped into the hopper of the crusher. The crusher consists of two grooved

cylinders, which, in revolving, break the skins without crushing the seeds. After passing through the crusher, the grapes fall into the stemmer. The stems are torn off and carried to one end of the machine, where they are discharged; the seeds, skins, pulp, and juice escape through the bottom and are conveyed in a chute to the press, which is usually on the floor below.

Pressing

The most improved forms of wine presses are now found in all of the large New York wineries. The old style wine presses are not used, except in a small way. The new presses are the result of American skill and mechanical ingenuity. It is interesting to note here that foreign manufacturers have taken American wine presses as their models.

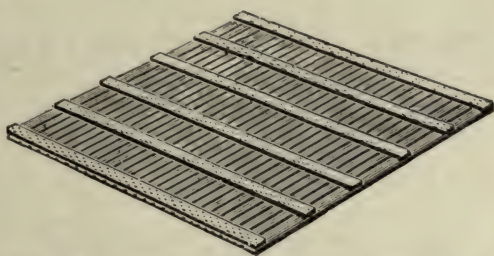


FIG. 414.— SINGLE GRAPE RACK FOR HYDRAULIC WINE PRESS

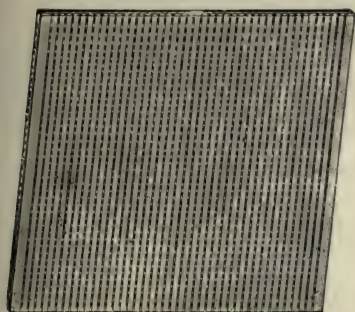


FIG. 415.— DOUBLE RACK FOR HYDRAULIC WINE PRESS

There are three kinds or types of wine presses — the screw, the knuckle joint, and the hydraulic. The latter type of press is a marvel of power, convenience, and efficiency. In using the hydraulic press the pomace is built up into a “cheese” with a system of cloths and racks. The single racks are made square, of wooden strips one-half inch thick by one and one-half inch wide, placed one-

quarter inch apart, with five or more strips two inches wide nailed across (Fig. 414). The double racks are made with the same number of slats both ways, closely nailed (Fig. 415).

The manner of building up a grape cheese is thus described by

the Boomer & Boschert Press Company, of Syracuse, N. Y., the leading manufacturers of wine machinery:

Start on the platform of the press and lay a rack; place thereon a form three and one-half inches deep, and five or six inches smaller each way than the rack. Over this form spread a high-grade cotton cloth which comes for the purpose. Fill the form even full of pomace, then turn in the sides and ends of the cloth over the pomace, the cloth being of sufficient size to cover.

The form is now raised and another rack placed upon the layer of pomace thus made, the form being placed upon the new rack, a cloth again placed over it, and another layer of pomace put in as before. Eight or ten racks are used in one cheese, and as many cloths less one. When the last layer is formed, the form is taken off and a rack placed. The follower is then put on and the pressure applied.

The advantages of the hydraulic wine press are, that it is a clean and sanitary method and that it yields more juice, of a better quality, and at a less cost than was given by the old style presses.

In large wineries, where many tons of grapes must be handled daily, a number of hydraulic presses are operated. To keep the presses rapidly supplied with material, a transfer car system is used. This system consist of trucks running on tracks laid on the floor between the presses and loading platform, whereby loaded and unloaded trucks are transferred between the presses and the loading platform. Thus, while one cheese is in the press under pressure, another is ready to take its place when it is removed. The transfer car system is shown in Fig. 412.

Fermentation

The juice, or must, is conveyed from the press into open tanks or vats which have a capacity of from 500 to 5,000 gallons or more. It is good practice, particularly in the manufacture of dry white wines, to allow the must to settle and clear itself before putting it into the fermenting vessels.

The minute yeast cells on the outside and bloom of the grape cause fermentation. They multiply and attack the sugar in the must, breaking it up into almost equal parts of alcohol and carbonic acid gas. As soon as the active fermentation is completed, the new wine is drawn from the pomace and is put into closed casks and tanks. It now undergoes a slow, or so-called secondary fermentation, and the sediment settles to the bottom.

When the new wines have fully settled, they should be drawn off into clean casks in order to rid them of the sediment. This

operation is called "racking." The first racking is usually done during the first month or six weeks; second racking is necessary at the end of the winter, and a third racking is desirable late in the summer or in the fall.

Before the wine is ready for consumption or for bottling, it should be rendered perfectly clear and bright. This is accomplished by fining. The materials most commonly used are isinglass, white or fresh egg, and gelatine.



FIG. 416.—WASHING WINE BOTTLES BY MACHINERY

CLASSIFICATION OF WINES

Wines are usually divided into two broad classes, dry wines and sweet wines. Dry wines are those in which the sugar has been entirely or almost fermented out. They may be either red or white in color. Of the red dry wines the most common kinds are claret and Burgundy. The white dry wines include Catawba, Delaware, and wines of the Rhine and Moselle types.

Sweet wines are those in which most of the sugar must have been retained, the fermentation being stopped by the addition of grape brandy. This addition of alcohol to sweet wines is called

“fortifying.” The best known types of sweet wines are, Port, Sherry, Tokay, Madeira, Angelica, Sweet Catawba, and the like.

Wines are also classed as “still” and “sparkling.” Still wines are those in which the carbonic gas formed during fermentation has wholly escaped. Sparkling wines are those which are so manipulated as to hold more or less carbonic acid gas.



FIG. 417.—BOTTLING AND CORKING THE NEW CHAMPAGNE TO BE FERMENTED IN THE BOTTLE AND AGED IN TWO VAULTS

NEW YORK'S CHAMPAGNE INDUSTRY

Reference has been made to the extent and importance of the New York champagne industry. The headquarters of this industry are in the Lake Keuka district. Here there are about nine or ten large concerns whose principal output is champagne. Several of the largest cellars carry in stock from 1,000,000 to 1,500,000 bottles of champagne.

At Hammondsport, at the head of the lake, the following champagne houses may be mentioned: Germania Wine Cellars, Hammondsport Wine Company and the Roualet Wine Company. A

few miles out of the town at Rheims is the Pleasant Valley Wine Company. Four miles down the lake from Hammondsport, at Urbana, are the cellars of the Urbana Wine Company. Five miles further down on the lake is the plant of the White Top Champagne Company. At the foot of Lake Keuka at Penn Yan are the Hammondsport Vintage Company, Empire State Wine Company and Garrett & Company. The leading champagne house outside of the district is the Brotherhood Wine Company, at Washingtonville, N. Y.

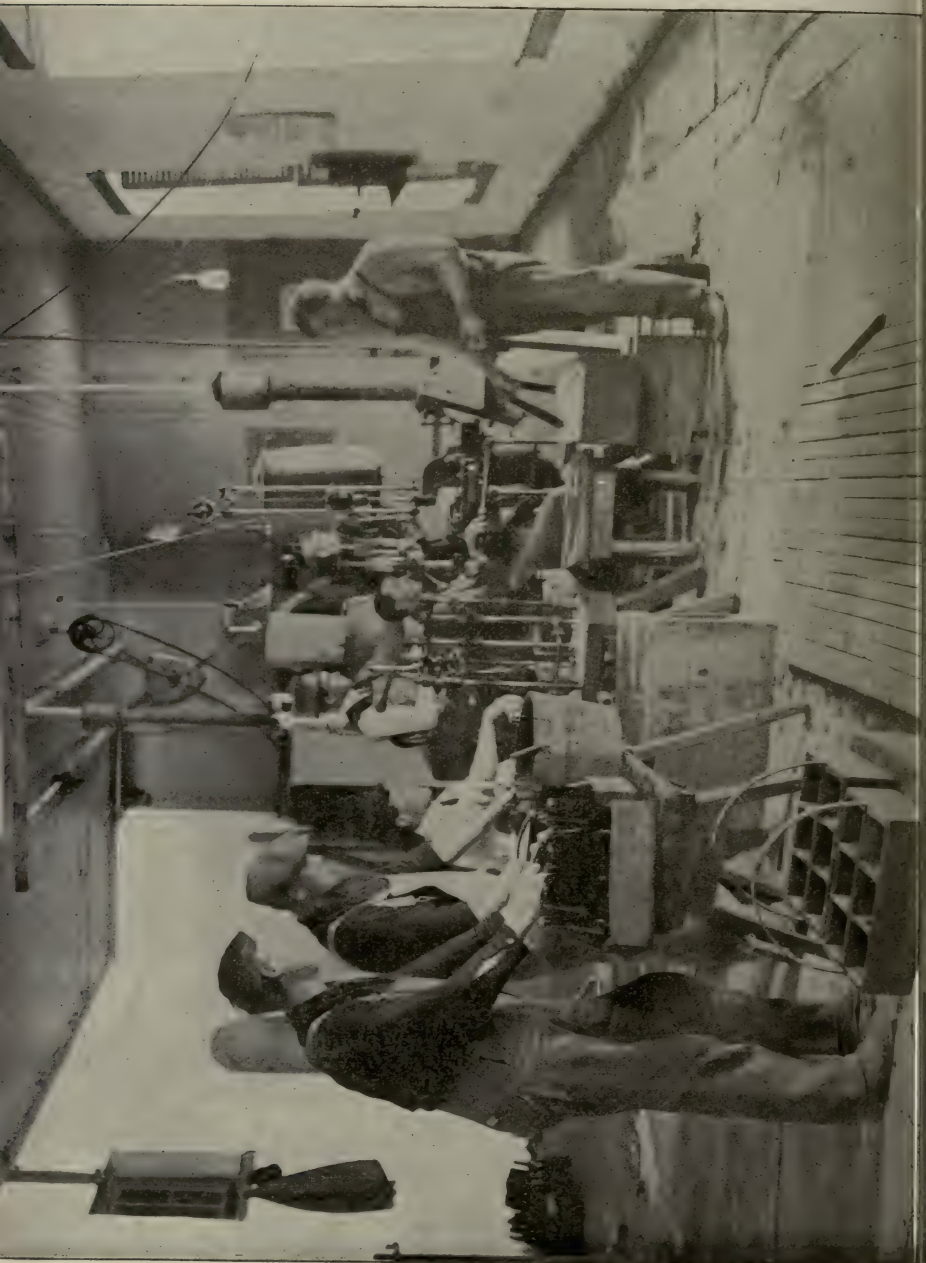
It requires skill and expert knowledge to make champagne. As the process is interesting, and as it is not generally understood, some of the principal features may be briefly described.

When the wine has gone through its first fermentation, it is racked off into casks, where it remains for some time, or until a blend of the different wines is made. This is called the "cuvée." The wine is now bottled and a second fermentation is started. The bottles are put in cool vaults, where they are packed in horizontal layers with thin strips of wood between each layer. The wine in this stage is said to be in "tirage," (Fig. 408).

The gas that has been generated by fermentation is confined in the bottles and absorbed by the wine. Thus, when a bottle of champagne is uncorked, the gas, seeking to escape, bubbles through the wine to the surface and produces that sparkling effect which is so much admired.

It is necessary to keep the vaults at a fairly even and low temperature, or from 50 to 55 degrees F., in order to prevent loss from breakage which a sharp or sudden rise in temperature would cause. This factor is controlled in most of the cellars by a cold-storage system. The pressure of the gas, being from 75 to 80 pounds per square inch, requires the use of French bottles of great strength and of the best Spanish corks. The corks are secured to the neck of the bottles by a metal band, called an "agraffe."

After the wine has been in tirage from one to two years, the bottles are placed on clearing tables (Fig. 411), or A-shaped racks, the neck of the bottle pointing downward. In order to throw the sediment, which has formed during the fermentation, down upon the cork, the workmen turn or shake each bottle daily



for a period of one or two months. After a while the sediment is collected in the neck of the bottle, while the body of the wine is perfectly clear. Then the bottles are taken to the finishing room, cork down, and the wine is "disgorged." This process consists in freezing the small quantity of wine in the neck of the bottle containing the sediment. The *agraffe* is removed, and the pressure of the gas forces out the cork and the frozen sediment.



FIG. 419.—LABELLING, CAPPING, WRAPPING, AND BOXING CHAMPAGNE READY FOR SHIPMENT

The wine in this state is not only absolutely dry, or free from sugar, but it is harsh or brut, to use the French term. To please the taste and palate of consumers, the wine is softened and sweetened by a "dosage," as the French wine makers call it; that is, by the addition of a little rock candy syrup dissolved in old wine or brandy. Thus, champagne is described as "brut," "extra dry" or "sec," according to the amount of the dosage.

The final operations consist in putting a fine cork in the bottle, wiring and capping it, pasting on the label, and casing the bottles in boxes ready for shipment.

THE NEEDS OF THE WINE INDUSTRY

There is no doubt that the New York wine industry has made sure and steady progress. The industry would have made even greater progress if the conditions had been more favorable.

Considering the extent and importance of viticulture in the state; the thousands of people employed, and the millions of dollars invested in vineyards, buildings, cellars and plants, cooperage, stocks of wines — considering these and other things that might be named, New York should do more to encourage her grape and wine-producing industry. Further efforts should be made to promote this branch of agriculture, which will bring increased prosperity and wealth to the state.

Our vineyards have been greatly assisted by the State Department of Agriculture, which has helped them in many practical ways. But much remains to be done for the New York grape and wine growers. There should be a State Viticultural Experiment Station. There are now two viticultural experiment stations in the Eastern States, one at Willard, N. C., and another at Vine-land, N. J.; while there are fourteen viticultural stations in California.

Before New York can make suitable progress in her viticultural industry, a viticultural school or college is necessary. In the same way that an agricultural college is indispensable for the training of future farmers, so the viticultural college is required for the education of future grape-growers and wine-makers. If the European countries, in which grape growing and wine making have been carried on for centuries, find these colleges necessary, how much more must they be needed in this country where the wine industry is comparatively young and undeveloped.

New York State owes it to her people and to herself that a viticultural school should be organized in the near future. Such a school could easily be included in the agricultural department of one of our New York colleges or universities. For many years past grape growing and wine making have been taught at the University of California, which enjoys the distinction of being the only university in the United States that has a viticultural department.

Again, the consumption of our pure, wholesome wines is not

as large as it should be. This is largely due to the present methods of distribution, which do not favor the sale and consumption of wines. Hence our present excise laws should be amended so that, aside from saloons, there should be a separate license for the sale of wines only. Then we would have cafés and wine shops such as are found in France, Germany and Italy — popular and respectable places where the people can take a glass of wine, or whatever drink they wish, where friends and families meet and visit, enjoy the music, and pass a pleasant hour.

Finally, our people need to be educated as to the food value of wine. They should learn to use wines as they should be used, that is, daily at table with their meals. Wines are so used all over continental Europe where practically everyone — men, women and children — drink wine as freely as Americans do coffee and tea, and there you find the most temperate people in the world. While there may be and is intemperance in drinking as well as in eating, yet at the same time it is true that, when wine is properly used at table with the meal, it adds to the pleasure of life, and, as has been truly said, whatever adds to the pleasure of life adds to its resources and power.

THE GRAPE JUICE INDUSTRY

GERALD FREY, of *The Grape Belt*, Dunkirk, N. Y.

Wherever grapes are grown, be the production ever so small, there it will be found that a large portion of the fruit is being pressed for its juice. It may be wine that is being sought, or perhaps juice free from fermentation; but, nevertheless, grapes will be pressed as surely as there are vines upon which to bring the fruit into being.

New York ranks second among the states of the Union in the quantity of grapes produced, being exceeded only by California. It naturally follows that the Empire State is equally prominent in the matter of grape-juice production, both fermented and unfermented.

In the early days the grape juice produced in the state was naturally small in amount, and was consumed almost entirely by the families making it or in connection with religious services. As years went by, and the growing of grapes became a business, the making of wine was commercialized and increased in amount in accordance with the growing demand and the improved facilities for pressing and transportation. When methods were finally discovered for keeping grape juice in an unfermented state indefinitely, the growing of grapes and the making of juice received its greatest impetus.

The several grape belts of the state are all producers of wine and unfermented juice, but the Chautauqua belt, lying along the shore of Lake Erie in the western part of the state, is far in the lead in that respect; in fact, it leads the world in the production of unfermented grape juice. This belt comprises about 37,000 acres of vineyards, and in normal years yields from 75,000 to 80,000 tons of grapes. In late years more than one-third of its total crop has been pressed for wine and unfermented juice within the belt.

The Concord is the king of grapes in the Chautauqua belt, as it is also in the other grape-raising sections of the state; and it is

the Concord that is used almost wholly in the making of unfermented juice and very largely in the production of wine. Although other varieties of grapes are used for the higher grades of wine, the Concord forms the backbone of the juice industry, being used almost exclusively in the making of Italian or sour wines and unfermented grape juice.

During the last ten years, including the season of 1915, the volume of grapes turned into both fermented and unfermented grape juice, in the section of the Chautauqua grape belt lying wholly within the state of New York, amounted to about 145,000 tons. Averaging ten tons of actual fruit to the car and fifty cars to the train, it was equivalent to 14,500 cars, and 290 solid trains. The total amount paid the growers for this great amount of fruit by the makers of wine and unfermented juice was approximately \$4,400,000, an average of about \$440,000 a year. The aggregate production of juice in that period and from that tonnage was 22,825,075 gallons, a yearly average of about 2,280,000 gallons.

The following table shows the combined wine and unfermented grape-juice product of the Chautauqua belt during the last decade:

Year	Gallons
1906	1,637,000
1907	1,779,000
1908	1,813,500
1909	2,035,000
1910	*2,100,000
1911	2,500,500
1912	2,778,000
1913	2,895,780
1914	3,790,420
1915	1,495,875
Total	22,825,075

During the five-year period immediately preceding 1906, the total production was 7,113,300, divided by years as follows:

Year	Gallons
1901	1,718,100
1902	1,588,700
1903	1,111,500
1904	1,845,000
1905	850,000
Total	7,113,300

The great increase in the amount of juice produced in the Chautauqua grape belt in recent years is made quickly apparent

* Estimated.

by a reference to the foregoing statistics. The production in the last five years was 13,460,575 gallons, an increase of 4,096,075 gallons over the five-year period immediately preceding, and of 6,347,275 gallons over the corresponding stretch of years beginning with 1901.

Likewise, the juice output for the 1906-1910 period registered a gain of 2,251,200 gallons over the 1901-1905 period.

These comparisons plainly indicate that there was a substantially steady increase each season from 1905 up to and including 1914. In 1915 the juice production showed a dropping off of about 2,300,000 gallons compared with that of the last preceding season. It was the smallest production in the last ten years, due to a heavy falling off in consumption during the closing months of 1914 and the greater part of 1915 by reason of industrial depression, unfavorable weather, curtailment of foreign trade, and other causes, and resulting in the juice-makers having left on their hands a large surplus of juice products.

In the early years of the history of the Chautauqua grape belt, the juice produced was confined almost wholly to wine-making. Then came the making of unfermented juice. As the demand for the non-alcoholic juice increased with leaps and bounds, the pioneer makers of this product proceeded to enlarge their output, and new companies embarked in the business. In time, grape juice far outstripped wine in the amount produced, as is shown by the following comparative table covering the last five seasons:

Year	GALLONS PRODUCED	
	Wine	Unfermented Juice
1911	770,000	1,730,500
1912	871,800	1,906,836
1913	226,240	2,669,540
1914	633,750	3,156,670
1915	386,250	1,109,625
Totals	2,888,040	10,573,171

It will be noted that the production of unfermented juice in the Chautauqua belt during the last five-year period was nearly four times as great as the output of fermented juice or wine. Moreover, it will be seen that while the production of wine fluctuated greatly in the first four years of that period (1915 not being considered, because of its abnormal condition), the output

of unfermented juice enjoyed a steady advance each year, and culminated in the record production in 1914 of about 1,400,000 gallons over that of 1911. The output of unfermented juice in 1914 was nearly five times as great as the amount of wine produced in the belt that same season.

In fifteen years the making of unfermented juice has grown from an almost negligible factor to a commanding position in the Chautauqua belt. Of still greater moment, it has bridged over the crisis arising from the big falling off in the demand for small-basket or table grapes, and has been the determining influence in the maintenance of good prices to the growers.

CULTURAL METHODS FOR THE GRAPE IN NEW YORK

F. E. GLADWIN

Associate Agriculturist, Vineyard Laboratory of the New York Agricultural
Experiment Station, Fredonia, N. Y.

*"A free loose earth is what the vines demand,
Where wind and frost have help'd the lab'rer's hand."*

VERGIL

Commercial grape growing in New York is limited to four well-defined sections of the state. Arranged in order of their importance they are: the Chautauqua and Erie belt, the Central Lakes district, the Hudson Valley, and the Niagara plateau. The four areas present widely diverse conditions of climate and topography. This diversity is reflected in the varieties grown, and consequently the period of maturity for the same variety in each district presents a succession of season.

Diversity of Locations

In the four districts are vineyards located on level lands, such as the Niagara plateau, on level to gentle-sloping land, as in the Chautauqua and Erie belt, on the somewhat more elevated and abrupt vineyards of the Hudson Valley, and finally on the steep hillsides of the Central Lakes region. These differences in topography would seem to indicate that the grape can be grown successfully under variable conditions, but the ideal location of the vineyard is on easy-sloping land. Many fine vineyards are located on steep hillsides, yet liability to washing and difficulty of tillage tend to render such vineyards less productive and shorter-lived. The shores about the large lakes appear to be especially well adapted to grapes—these districts in some cases extending several miles back from the water. Very rarely can grapes be grown in our northernmost latitudes without the increased labor and cost of covering in winter, except under the tempering influence of large bodies of water. Low situations that prevent a free circulation of air, such as river bottoms and the basins of small lakes, should be avoided. These locations are more liable

to unseasonable frosts, and their poor air drainage also favors powdery mildew and black rot.

There is much difference of opinion as to the direction in which the rows should run. In the Chautauqua grape belt the prevailing direction is north and south, where the slope is not too steep. This is ideal for the Chautauqua section, as the morning sun rapidly dries the dew on the east side of the rows while the prevailing wind dries the west. The constant west and northwest wind is probably the chief reason why this district is so free from black rot. Where the slope is steep, the rows must necessarily run at right angles to it. The foregoing does not necessarily mean that the grape cannot be grown on level land, for such is not the case. Many fine vigorous vineyards are so situated, but as a rule sloping land has the better natural surface drainage. The region near a large body of water is usually rolling or sloping, and more vineyards are, therefore, found on slopes than on level land.



FIG. 420.—A HILLSIDE VINEYARD IN CENTRAL NEW YORK

ESSENTIAL SOIL CONDITIONS

Experience shows that grapes may be grown on a great variety of soils. Productive vineyards are found on loam, sandy loam, gravel, gravelly loam, heavy clay, silt loam, and clay loam. It is not so much a question of the kind of soil, but the condition

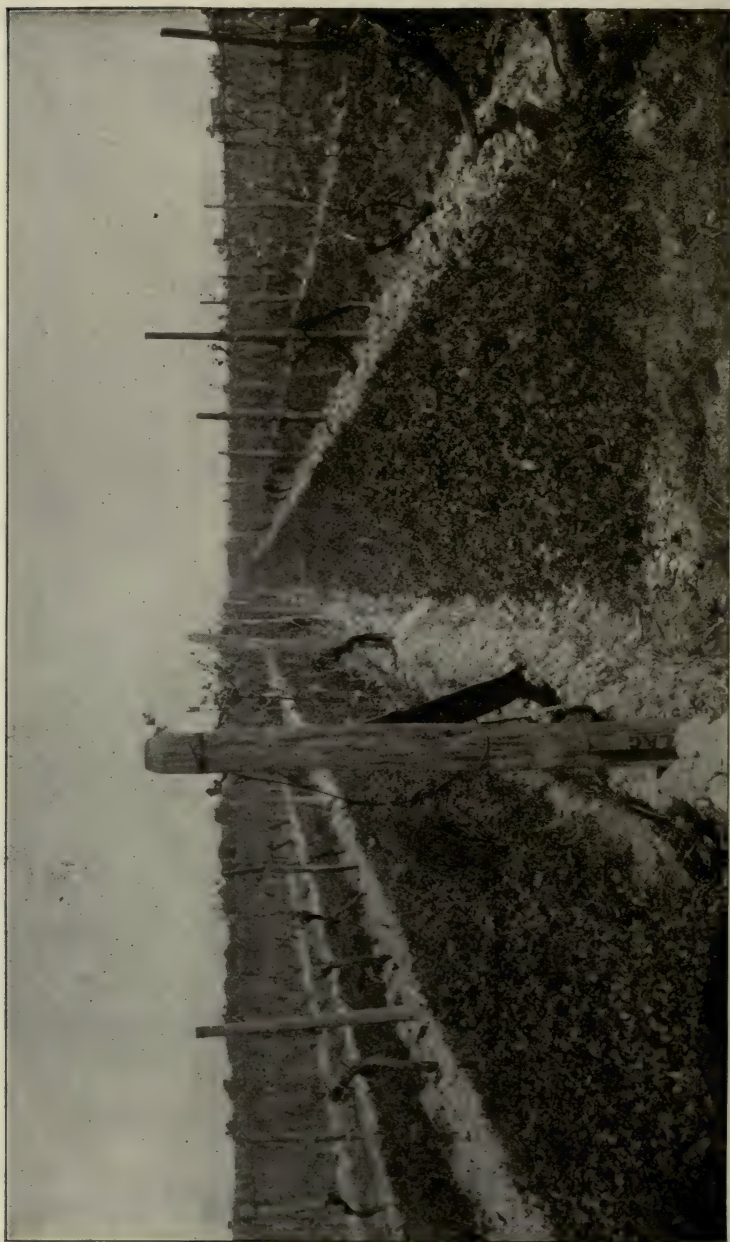


FIG. 421.—MAMMOTH CLOVER AS A GREEN MANURE IN THE VINEYARD

of that soil as regards texture, drainage, and fertility, and the possibility of washing. It is true that certain varieties exhibit a soil preference, but most commercial varieties will thrive on the many types.

Drainage

The first essential is that there be good drainage. The cultivated grape does not thrive with its roots continuously in water, although it may be more tolerant in this respect than most fruits. A natural conclusion prevails that sloping land is well drained; yet this is not always true. Especially if the soil is shallow, an impervious rock, or hardpan, below may form basins, or "kettle holes," in which water is retained; the soil becomes saturated since the water must rise to the surface to escape. Under such conditions, a slope is just as water-logged and as poorly drained as a lowland area. If the drainage is not good, the field should be tiled.

Preparation of Soil

In the preparation of the soil for setting to a vineyard, the grower should exercise the greatest care. It is poor policy to set vines in carelessly prepared soil. A little care before setting will pay for itself many times over. As a general rule it is poor practice to set to grapes land that has just been in vineyard, without putting under a good green manure two or three times in succession before planting. When it is desired to reset land where vineyards have been pulled out, hairy vetch or mammoth clover in August should be sown and plowed under just before blossoming time in the following summer. If in the following spring the land is again seeded to vetch or clover and plowed under, it will then be ready for planting. This is likewise an excellent practice preparatory to the setting of a new vineyard. Deep plowing, thorough dragging, and rolling, combined with green manuring, puts the soil in the best of tilth and, once in good tilth, it is far easier to maintain than without such thorough preparation.

In fitting the field, preparatory to planting, plow as deeply as possible, with a two-horse plow, into lands eight or nine feet wide, the width depending on the distance apart which the rows are to be. This will leave dead furrows eight or nine feet apart.

Then with a subsoil plow, go twice through each dead furrow. Much of the soil loosened by the subsoiler can now be thrown out by again going through each furrow with the two-horse plow, once each way. This insures deep planting and greatly increases the area for root growth.

PLANTING OF VINEYARD

Selection of Vines

The selection of vines is an important part in the foundation of the vineyard. Too often it is neglected altogether, by reason of the inability of the prospective grower to judge vines, or else when poor vines are purchased knowingly because they are cheap. A poor vine purchased because of cheapness is a poor investment. A vineyard started with poor vines is handicapped at the start and rarely, if ever, overcomes the burden even with good care later on.

First-grade, one-year vines are to be preferred to two-year ones. As a rule they are much better, although to the amateur a large vine promises more. Very frequently two-year vines represent the poorer one-year vines of the previous season transplanted and allowed to grow in the nursery row another season. Most commercial vineyards are set with one-year vines, while the amateur usually sets the two-year. There are doubtless some good two-year vines, but they are the exception.

Laying Out the Vineyard

There are many recommendations as to the distances apart for rows and vines. Some of the older vineyards are set ten by ten feet, but the prevailing distances are for rows nine feet apart and for vines eight feet. Eight by eight feet appears to be most suitable, as an eight-foot row can be plowed most satisfactorily with a three-gang plow by going twice through the row, and subsequent tillage with spring-tooth harrow and disk may be economically done. Many of the newer vineyards are being set eight by six feet and some even eight by four feet. In this instance the grower plans to take out every other vine as soon as two or three crops have been harvested; or else leave and put up but half the

wood for each vine that is usually put up when they are set eight by eight feet. Observation has shown, however, that orchardists who have set trees closer than they should have been, intending to remove alternate trees when they arrived at maturity, find it exceedingly heart-breaking to remove a healthy bearing tree; this no doubt will hold with the vineyardist who is setting eight by four feet with the intention of pulling out each alternate vine.

Setting the Vines

After the field has been plowed in lands of the desired width, stakes are now set in the furrow at the interval decided on for the vines in the row. These should be lined carefully each way. Then with the hoe and shovel, the hole is dug in the bottom of the furrow with the stake as the center. This can be readily done, as the plowing has loosened the soil. There is not much danger of setting the vine too deep, but rather at the other extreme is the error usually made. The hole should be dug deep enough so that the bottom may be filled in with surface soil, leaving a mound in the center of the hole on which the base of the vine is to rest. It should be large enough to accomodate the roots without crowding. The roots are cut back more or less severely, depending on their growth and condition, but generally to about eight or ten inches from the base. The top is cut back to two or three buds. The roots are then spread out in the hole so that they are equally disposed in all directions, the base of the vine resting on the mound, with the roots sloping downward at an angle; a small quantity of the surface soil is then tamped firmly upon them. More soil is added and firmly packed until the hole is nearly filled, but the surface soil is left loose. The vine should now be a sufficient depth so that the two or three buds of the top are just above the ground. In the following winter or spring the growth of the previous season is cut back to two buds, for we should aim to obtain a well-established root system above all else. At the beginning of the second year we find our vine apparently in the same condition as in the year of setting. In the second spring one wire of the trellis should be put up, not to fix the future training, but to get the canes out of the way for cultivation.



The Trellis

Chestnut or locust posts are preferred for the trellis. These should be from six to eight feet in length, and the heaviest should be selected for end posts. After sharpening to a tapering point they can be driven into holes made with a crowbar. Care should be taken to place them so that they will line perfectly on the side toward the prevailing wind, on which side the wire is fastened. A post to every three vines is sufficient. The end posts should be driven to a depth of from 22 to 24 inches and braced by a two by four or four by four, notched to fit the post half way from the ground to the top and extending obliquely to the ground where it is held by a four by four stake. The wire should be No. 9 or No. 10, the number and height of the wires depending on the vigor of the vines and the system of training used. The wires are fastened to the posts by ordinary fence staples, enough space being left in the staple to permit loosening or tightening. The wire is fastened to the end post by winding it once around the post and then around itself.

PRUNING THE GRAPE

The grape is pruned, first, to limit the amount of wood, thus preventing overbearing, and thereby producing fruit of quality without sacrificing the vigor of the vine; secondly, to keep the vine within bounds, thus economizing the land and facilitating cultivation, spraying, and harvesting. In pruning grapes, as in pruning any other fruit-bearing plant, the relationship of the wood to fruit bearing must be thoroughly understood.* The successful vineyardist must ever keep in mind that the fruit of the present year is borne at the base of shoots of this year, which spring from the canes of last year, or from the older wood. That there may be produced fruit of the best size and flavor, it is obvious that a vine must be limited in production. Judicious pruning aims to accomplish this. A good average yield for a Concord vine would be fifteen pounds, although certain vines have averaged much more. In order to produce this amount, we estimate that from forty to sixty clusters are required. Since

* See article on Pruning by E. van Alstyne, Part I, page 830.

each shoot bears from two to three clusters, usually two, twenty to thirty buds of the previous year's growth must therefore be left. This can be done by leaving a sufficient number of canes or spurs carrying the number of buds already mentioned. Good pruning then consists of cutting out all the wood except canes or spurs sufficient to furnish the shoots for the desired number of clusters.

Time for Pruning

The time for pruning the grape varies somewhat with different growers and various localities; as a rule, it may be begun as soon as the vine has dropped its leaves in fall. Any time after this to a period just before the swelling of the buds in spring, may be given to this work. Some vineyardists even prune after a vigorous flow of sap has begun, asserting there is no serious injury therefrom. There is a considerable sap flow in the vine even before weather conditions appear favorable for it, so that it is best not to delay the operation too late. In certain sections where grapes are grown commercially, in order to prevent freezing, it is necessary to cover the vines in position or to lay them on the ground for covering because of severe winter weather. In order to lessen the area to be covered, it is good practice to prune to some extent before covering. In doing this, it is advisable to leave more wood than is actually needed for next year's crop, as there is danger that some of the buds may be broken off or the canes otherwise injured from this covering. There is an old saying, "Never prune when the wood is actually frozen," for which some foundation can be found, since canes are much more liable to breakage if handled when frozen. Other than this, there is no reason why pruning should not be done at any time during the dormant season. In the Chautauqua belt, pruning begins with the falling of the leaves and continues during the winter until just before the buds begin to swell. The milder days, of course, are preferred.

Types of Pruning

Judicious pruning of the grape is more essential than is training to system, but there necessarily exists a relationship between pruning and training. If the condition of the vine permits, it may be pruned; but, in many instances, its vigor, as shown by



FIG. 423.—HARVESTING THE CROP

the wood produced, will not allow of the pruning necessary to train to a desired system. The subject of pruning and training therefore becomes largely a matter of judgment with the vineyardist. He alone is best able to judge how much pruning each vine in his vineyard should receive, and the system of training by which the wood can be put up to the best advantage. If the vines are vigorous, it becomes optional with the grower, although there is no doubt that certain varieties do best when trained to a certain type. It is generally agreed, for example, that strong-growing varieties, such as Concord and Niagara, do best when trained to the drooping type; while the weaker and slower-growing, such as the Delaware, can be best trained to some form of the upright type, other conditions being the same. Perhaps it should be stated that the terms applied to these various types refer to the position the bearing shoots assume, rather than to that of the canes. The drooping type and the upright are commonly used today, while the horizontal has generally been discarded.

Drooping Type. The Kniffen system and its modifications are representative of this mode of training. The growing shoots of the season are not tied, but are allowed to hang free. In this respect, it is economical, since no summer tying is necessary; while the pendant position so places the clusters that there is less liability to sun scald.

Single-stem, Four-cane Kniffen. In this system a single trunk or stem is carried directly to the top of the trellis. With strong vines this can be done in the third year after setting; but with weak ones, a year later is better. One wire is placed at a height of from five and one-half to six feet above the ground, the lower wire being from three to three and one-half feet above the ground. Two canes are taken from side spurs on the trunk at the level of each wire, or just below the wire. The two upper canes are left longer than are the two on the lower wire, since, if this is not done, there is a tendency for rank, long-jointed canes, growth being most vigorous at the extremity of the stem. The trunk or stem is tied firmly to each wire and is kept in this position permanently. Each spring the four canes left after pruning are tied to the right and left of the stem along each wire.

In the following year pruning consists in cutting out all but four canes that have developed from the spurs or canes of the previous year, and selecting those that are as close as possible to the main trunk. Thus the bearing wood is renewed yearly.



FIG. 424.—THE SINGLE-STEM KNIFFEN SYSTEM OF TRAINING

As the spurs will lengthen rapidly, it will therefore become necessary to remove them entirely every five or six years. This can be done by selecting well-placed shoots that arise from time to time from the trunk or stem.

Two-stem, Four-cane Kniffen. This is very similar to the type just described, the only difference being that two permanent trunks are brought up from the ground. One of these is carried to the height of the lower wire, where two canes are taken off from spurs and tied to the wires as before; the other stem is carried to the top wire and two canes are taken from it. Some vineyardists prefer to tie the two stems together in order to make them stiffer. In using this method, the canes taken from each stem may have the same number of buds, each stem being considered as a distinct vine.

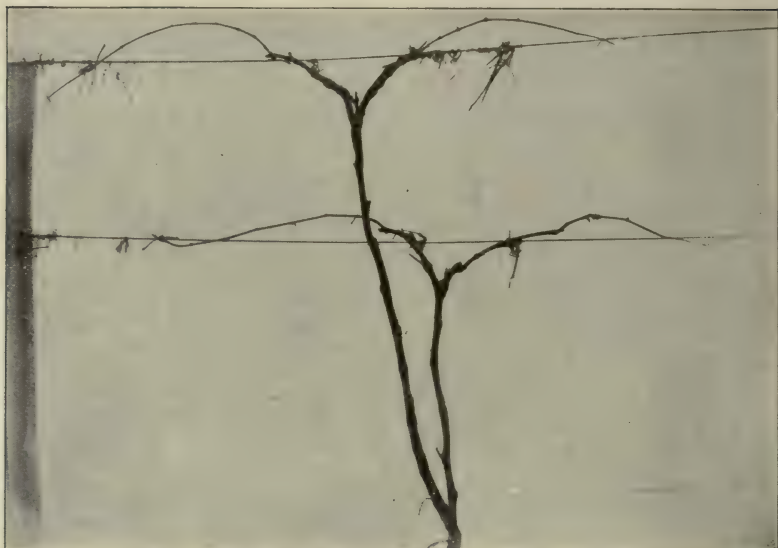


FIG. 425.—THE TWO-STEM KNIFFEN SYSTEM

Y-stem Kniffen. This differs from the foregoing in that, instead of the two stems being brought up from the ground, one is taken from the other at a distance a little below the lower wire, is carried to the wire at the top, and there tied. This makes a Y-shaped joint, as indicated in the name. The number of canes laid down and subsequent treatment are the same as in the others so far described.

Umbrella Kniffen. The chief differences between this system and the true Kniffen are the use of two canes instead of four, and the somewhat changed position given them. Two canes of from eight to twenty buds are taken from spurs on the trunk at the top wire. These are tied to the right and left along the wire and then bent down hooplike to the lower wire and secured. The canes are renewed yearly from spurs. This method is now much followed in the grape-growing belt in Pennsylvania.

One-wire Kniffen, or Low Kniffen. This system is a modification of the umbrella, but differs in that the trellis has only one wire, three to four feet above the ground. The single stem extends up to the wire, where two canes of from ten to twelve buds are taken off and laid down to the right and left of the stem.

The renewal each year, as in the case of all the others so far discussed, is from spurs. High quality of fruit and cheapness of trellis commend this system.

There are other modifications of the drooping type of training, but for one reason or another they have been dropped in commercial vineyards. The commoner are the six- and eight-cane Kniffen, in which three and four wires are required respectively, making an expensive trellis necessary.



FIG. 426.— THE UMBRELLA SYSTEM

The Upright Type. This type of training carries two or more canes along a horizontal wire, or obliquely across the wires. The two methods of renewal in this type naturally divide into two groups, namely, high renewal, or cane renewal, and spur renewal.

High Renewal. The high renewal system is in general use in many grape-growing sections, having much to commend it. The trellis is made with two, three, or more wires, but usually three. The lowest wire is placed from eighteen to thirty inches above the ground, while the second and third are from eighteen to twenty inches apart respectively. The main trunk or stem of

the vine is carried up to or just below the first wire and two canes, each bearing from six to ten buds, are taken off, preferably a little below the level of the wire. One is tied to the right and the other to the left. The bearing shoots that grow from the buds on these canes are tied to the second wire when they have reached a sufficient length, and to the third as soon as growth will permit. If they project beyond the upper wire, they are sometimes cut off or pinched back.

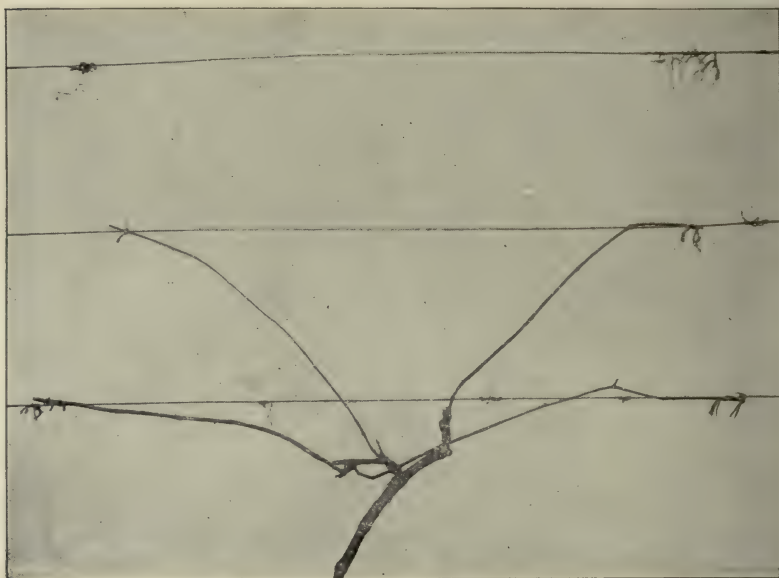


FIG. 427.—THE HIGH RENEWAL TYPE

At the beginning of the next year the vine should again be cut back to two canes that have grown from the shoots of the previous year, or from spurs, this cutting being as close to the head of the vine as possible. Near the base of each of these canes, but on older wood at the head of the stem, short spurs carrying two or three buds are maintained, from which shoots develop that in turn are used to furnish the fruiting canes of the following year. Thus, the spurs are the means of renewing the fruiting wood. From the foregoing it will be seen that the amount of old wood retained is reduced to a minimum, while the labor of tying is greatly increased.



FIG. 428.—DELAWARES ON KEUKA LAKE TRAINED TO HIGH RENEWAL



FIG. 429.—CATAWBA ON KEUKA LAKE, TRAINED TO HIGH RENEWAL

Horizontal Arm Spur. The trellis for this system is practically the same as for the high renewal. Two canes are laid down, one to the right and the other to the left of the trunk, which has been brought to the height of the lower wire or just below it. The number of buds left on each cane will depend on the vigor of the vine and the availability of the space between the adjoining vines. These canes are to become permanent arms, doing service for several years. The shoots that develop from buds on these canes in the present year are cut back to two buds in fall or winter. Two shoots are allowed to grow from each of these spurs and are tied to the upper wires. In the fall one cane from the upper part of the spur is cut entirely away, and the other cane is cut to two buds as before. Then, at the beginning of the next season, there are as in the previous year, two shoots springing from a spur on a permanent arm. The spurs will lengthen fast and become crooked; hence, it is the best practice to cut them entirely away every few years and to grow others from shoots that arise directly from the arms. The spurs may be distributed from ten to twenty inches apart on the arms.

Chautauqua System. This system is but a modification of the horizontal-arm-spur system just described, except that nine to twelve bud canes carry the fruit instead of short spurs. Permanent arms are used to support the canes, which are tied yearly to a two- or three-wire trellis. These canes may be tied perpendicularly or obliquely. If two wires are used, they are usually thirty-four inches apart; if three, about twenty inches apart. In the following year the canes for tying develop either directly from the old wood of the arms, from spurs on the arms, or from the basal buds of the past season's canes. This system has a strong hold on the vineyardists of Chautauqua County, for the principal grape, the Concord, adapts itself fairly well to training according to this system. The old arms should be renewed frequently, since in time they become crooked and gnarled, the extremities often being a great distance from the head of the vine.

Fan System. While still used in certain localities, the fan system of training is not nearly so popular as it was a few years since. Here the renewals are obtained yearly from spurs near the ground; hence, very little old wood is retained. One serious

objection to this system is the tendency of the spurs to lengthen, become crooked, and in some cases to reach midway between the first and second wires. The shoots are tied to the wires in the direction that they naturally assume. This may be vertically, horizontally, or obliquely across the wire. In regions where grapes are grown for home use and the climate necessitates winter protection, this system is used to advantage. It is also used to a considerable extent in many of the commercial vineyards of the Central New York lake region.

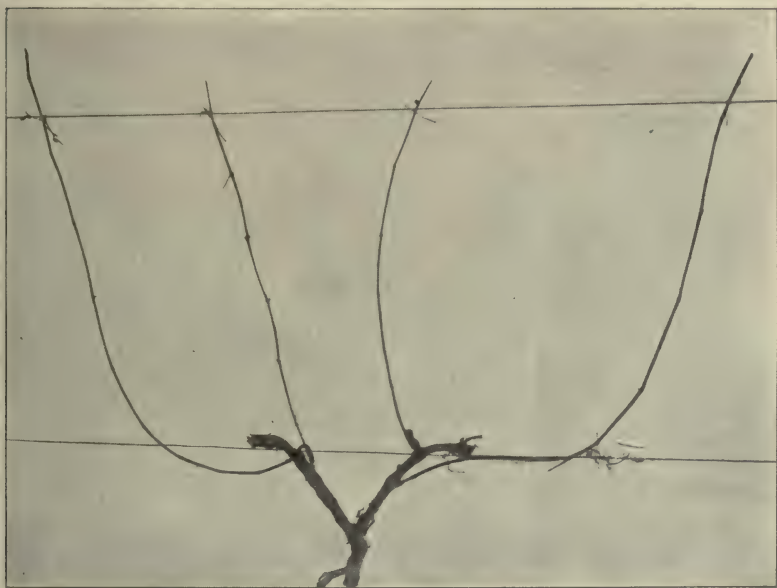


FIG. 430.—THE CHAUTAUQUA SYSTEM

The Horizontal Type. This type is little used at present, as the cost of the trellis and the labor of tying render it undesirable. One cane arising from a trunk one or two feet high is left after each pruning. This is carried perpendicularly to the top wire, and the shoots arising therefrom are tied to slats or wires extending vertically from the lower to the upper wire or the trellis. The one advantage of the system is the ease of control for varieties that are likely to overbear or those that are already weakened and require careful nursing.

The choice of a system of training is largely a matter of taste with the vineyardist. One type may be suited for his conditions, or at least may appeal to him as the ideal. His neighbor may be equally positive that a different system is better, and each may be right. That system should be selected which is best suited for the variety to be grown, and a knowledge of varietal habits is therefore indispensable. In commercial vineyards the expense of trellis and of pruning and tying becomes an important factor. To have merit, any system must be so adaptable to the variety or the vine that it will conserve the best energies of the vine from year to year. Likewise, a system that permits of overbearing in one year, at the sacrifice of vine energy and wood for the succeeding year, should be remodeled or dropped altogether. Of course, it is possible to so use any system of training that it may become detrimental to the vine, but certain systems of training permit of this to a greater degree than others.



FIG. 431.—EARLY SUMMER TILLAGE

It is generally conceded by vineyardists who have tried various systems that the Kniffen methods give better vines and fruit

under adverse conditions, such as lack of tillage and spraying, than do others. This statement, however, should not be interpreted to permit of the neglect of the vineyard, for tillage, spraying, and fertilizing will give returns proportionate to thoroughness.*

TILTH AND TILLAGE

Frequent and thorough tillage is essential for the vineyard. The first spring operation is the plowing under of cover crops with the single-horse and gang plow. This can be done as soon



FIG. 432.—HORSE-HOEING AWAY FROM THE VINES

as weather and soil conditions will permit. A single furrow is plowed up to or away from the vines on either side of the row; this operation is followed by the use of the gang plow and, if the cover crop is particularly heavy, with the disk harrow. The three-gang plow will cover an eight-and-one-half-foot row in one bout. If no cover crop was sown, the disk may replace the plow. Subsequent cultivation is done with the grape hoe, hand hoe,

* For grafting of grapevines see Part I, page 965.

spring-tooth harrow, and disk. Just about the time that the rootworm has transformed to the pupa or turtle stage and has penetrated the upper layer of the soil, ready to emerge as an adult and lay its egg on the canes, the grape hoe is used to throw a furrow away from the hills. This exposes the delicate pupal stage of the insect to the sun and other climatic conditions which are very destructive to it. Cultivate at regular intervals of ten



FIG. 433.—THE DIAMOND-TOOTH CULTIVATOR IS A GOOD WEED ERADICATOR IN WET SEASONS

days and always just before the soil has crusted from a rain, and especially frequently in a season of drought. About the first of August cultivation should be discontinued, either in the case of gang-plowing up to the vines, dragging, or plowing a single furrow to each side of the hill. Care should be observed to maintain the soil level throughout the entire width of the row during the growing season, thus insuring a more uniform distribution of rainfall.

Cover Crops

The vineyard should be sown to a cover crop at this time, either by broadcasting and dragging in with the spring-tooth harrow or else by being drilled in. Before sowing, it is well to watch the weather maps closely and to sow just before or just after rain. If good cultivation has been given, a good seed bed will result. Mammoth clover, hairy vetch, Canada field peas, cow-horn turnips, and winter wheat mixed with cow-horn turnips can be used. Mammoth clover and hairy vetch have proved very satisfactory and make ideal nitrogenous cover crops for the vineyard.

In addition to furnishing and liberating plant food in the soil, the organic-matter derived from a cover crop makes for a better mechanical condition and conserves moisture. A crop growing late in the fall, after the vines have ceased growing, utilizes nitrates which are being formed at that time and which would otherwise be lost by leaching. Especially does this hold true on knolls and hillsides liable to washing. There can be no doubt that the grape does best under frequent and thorough tillage, which means that organic matter and humus are being rapidly burned out of the soil. Hence the loss must be supplied by the use of stable manure or cover crops.

Fertilizers

The fertilizers required by the grape are still largely a matter of experiment; and, until this phase is thoroughly worked out, the grower must rely on his vines to show him what is needed. Even should the wood growth indicate a lack of nitrogen, however, it would not necessarily indicate that more nitrogen should be added to the soil, since a sufficient quantity might already be present and yet be unavailable by reason of poor tillage, lack of drainage, and other faulty practices.

Manuring

The above statements will apply equally well to the use of stable manure. No authentic evidence is at hand to show that grape yields have been increased by its use, nor can it be said that wood growth has been increased by its use alone. Certain

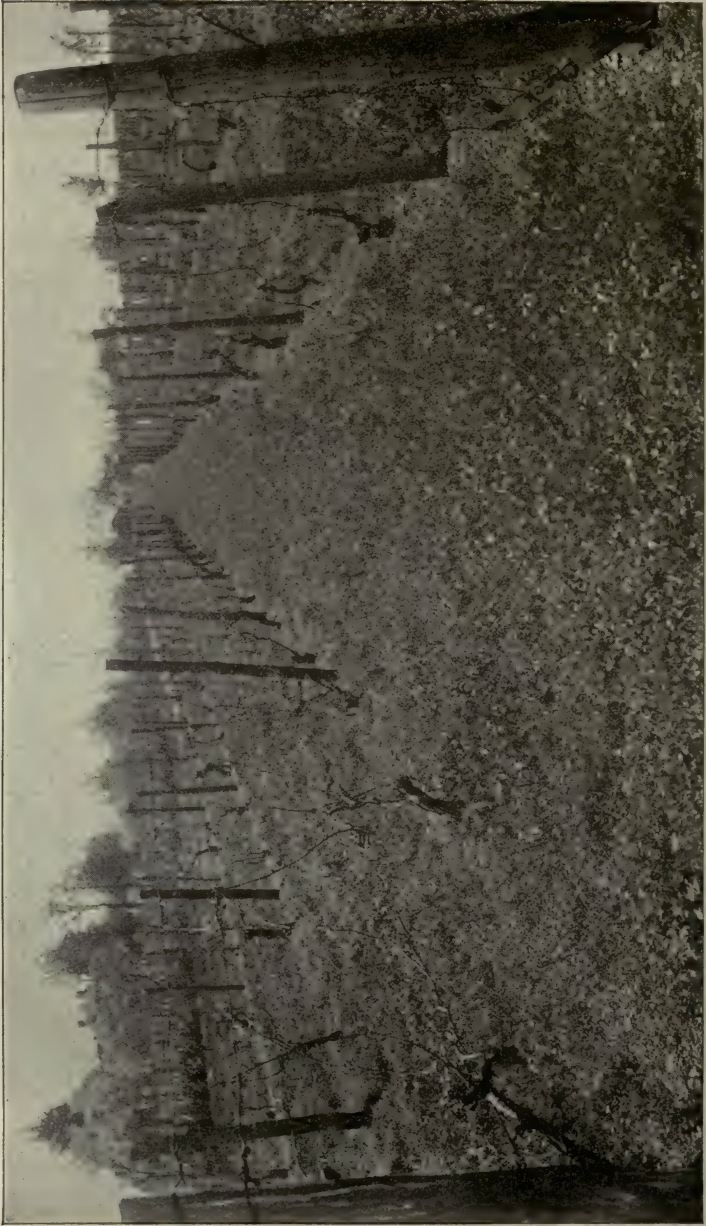


FIG. 434.—MAMMOTH CLOVER AND CHICKWEED COVERING THE VINEYARD

persons believe that such is the case, but conclusive evidence is lacking. There can be no doubt that stable manure does improve the soil texture of the vineyard, however.

No person should attempt to grow grapes for pleasure or profit, unless he is willing to give them proper care. The history of grape growing has been and is today one of ups and downs, and the specific reasons for the fluctuations are yet unknown. Undoubtedly a combination of causes is responsible. In every region of decline are many vineyards which are measuring up to the standard, and why? In all such vineyards the grower has given personal supervision and intelligent care to his vines and has not attempted to obtain a great yield in one year at the expense of the next, but rather has been satisfied to produce a fair crop each year. This should be the aim of each grower. Neither excessive wood growth nor an excessive yield in alternate years is desired, but a balance should be struck between the extremes.



FIG. 435.—LOADING THE GRAPES FOR TRANSFER TO PACKING SHED

CONTROL OF INSECTS INJURIOUS TO THE GRAPE

F. Z. HARTZELL

Associate Entomologist, Vineyard Laboratory of the New York Agricultural Experiment Station, Fredonia, N. Y.

GENERAL DIRECTIONS FOR THE TREATMENT OF VINEYARDS TO PREVENT INSECT DEPREDACTIONS



We note the stress laid by the medical world upon prophylactic measures, thus keeping men healthy rather than allowing them to become ill and then applying remedial treatment. The same logic applies to vineyard practice so far as parasites are concerned. In other words, it is usually comparatively easy to prevent serious trouble from insects, while if an injurious species becomes established it not only may cause considerable financial loss, but the owner may have a difficult problem in eradicating the pest. Special treatments for the control of the more injurious species are given below; but, before discussing these, directions will be given to assist growers to avoid such trouble.

Clean Culture

Conditions in and around vineyards often determine the susceptibility to or immunity from insect pests. Grape growers should not allow weeds or grass which die and lodge to remain above ground in the vineyard during the winter. Such growth can be prevented by planting cover crops which remain green during the winter. On level soil, plowing during the fall after the grape foliage has fallen will be found very beneficial if weeds and grass are present. If grape-berry moth is present, fall plowing, by which all fallen leaves are covered, will assist in the control of this pest, as well as other species which hibernate in rubbish. Vineyards infested with the rose chafer will be benefited by the planting of surrounding areas, in which this insect passes the larval stage, to cultivated crops. All fence rows and waste

places which cannot be cultivated should be burned over to destroy hibernating places of the grape leaf hopper and other species. In this connection we will add that berries should never be planted near grapes, owing to the fact that they afford hibernating places for and are the spring food plants of the grape leaf hopper. The destruction of all wild grapevines near vineyards will assist materially in the control of the grapevine flea-beetle. It is true that clean culture as defined above will not assist in the prevention or control of the grape root-worm.

Spraying

Every vineyard would be benefited by at least one annual application of bordeaux mixture (4-4-50) with 3 pounds of paste arsenate of lead, no matter how few insect pests might be present. This protects the vines from the powdery mildew, and also prevents insects from migrating into and thus becoming established in a vineyard. The application should be made about two weeks after the fruit has set. This single spraying has been found adequate in many of our experimental vineyards. This application should be made the first week in July.



FIG. 436.—INJURY TO ROOTS OF GRAPE BY LARVAE OF GRAPE ROOT-WORM.
NOTE ABSENCE OF ALL FIBROUS ROOTLETS

THE GRAPE ROOT-WORM

The grape root-worm is the larva of a grayish-brown beetle (*Fidia viticida* Walsh). This species is the most important in-



FIG. 437.—LARVA OF GRAPE ROOT-WORM
(Enlarged)

sect pest of grapes in New York. The larvae feed on the fibrous rootlets and later upon the bark and cambium layer of the larger roots. Vines showing roots with the bark channeled, together with an absence of small fibrous roots (Fig. 436), furnish almost conclusive evidence of the work of this pest, and when growers are not acquainted with the insect this root condition should be the first sign sought in a diagnosis of the cause of weakened vines. This feeding occurs during late summer and autumn, and during that time the grubs usually reach full growth (Fig. 437). Little feeding occurs in the spring. During June the grubs transform to pupae and emerge as adult beetles (Fig. 438) the latter part of June or early July.

The feeding of the adults produces characteristic chainlike markings on the upper side of the foliage (Fig. 439). The feeding is ravenous for the first few days after emergence, but diminishes with the in-



FIG. 438.—ADULT OF GRAPE ROOT-WORM
(Enlarged)

creased age of the adults. About two weeks after emergence, egg-laying begins and continues for about one month, during which time a female will lay about two hundred eggs. These

eggs are deposited under the rough bark of all parts of the vine above ground, but usually are more numerous on the canes. Hatching occurs during August and the young grubs seek the roots. The vast majority of individuals of this species complete their life cycle in a single season, but rarely an individual will require two years to complete its cycle.

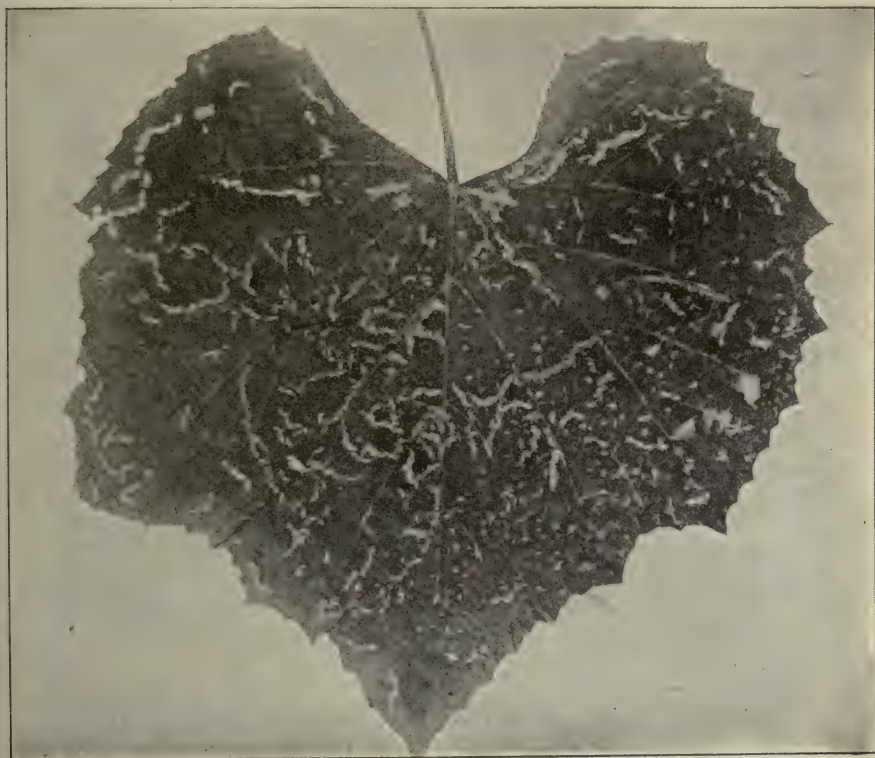


FIG. 439.—FEEDING BY ADULTS OF THE GRAPE ROOT-WORM.

Control

Two methods of control are practical: (1) destruction of the pupae, and (2) destruction of the adults before they lay their eggs.

Destruction of the Pupae

During the last cultivation of the season a low ridge is left under the vines. This ridge is usually removed rather early the following season, but when the vineyard is seriously infested with

root-worm this ridge should be allowed to remain until the majority of the larvae have pupated and then be removed with a horse-hoe. This operation crushes many of the pupae and also breaks open the cells of others, thus exposing them to the air and sunlight. While this operation is very helpful in the control of this species, it should not be relied upon entirely, for many of the pupae will be missed by the horse-hoe.



FIG. 440.—RESULT OF FEEDING BY ADULTS OF GRAPEVINE FLEA-BEETLE. PHOTO TAKEN JUNE 4. AT THIS TIME THE UNINJURED BUDS HAD PRODUCED SHOOTS ABOUT TWO FEET IN LENGTH

The most practical method of controlling the adults is spraying with poison sprays. The material to be used is determined by the amount of infestation. With a moderate number of beetles, excellent results are secured by spraying the vines with bordeaux mixture (4-4-50) and three pounds of arsenate of lead as soon as the first adults appear, followed by a second application in about ten days.

With a serious infestation the best results are secured by spraying the vines when the beetles are present in large numbers, using

a poison bait consisting of from one to two gallons of cheap stock molasses and six pounds of arsenate of lead in 100 gallons of water. Care should be exercised to apply this material so as to avoid rains, for the molasses greatly decreases the adhesion of the arsenate of lead. A second spraying should be made about one week later, using bordeaux mixture (4-4-50) and three pounds of arsenate of lead. This second spraying answers a twofold purpose:

1. It replaces any poison of the first spray that may be washed off by rains.

2. It seems to repel migrating beetles which would otherwise deposit their eggs.

THE GRAPEVINE FLEA-BEETLE

When the buds of the grapes are swelling, trim, shining steel-blue beetles often make their appearance on the vines and feed upon the tender buds. These beetles are very active and, upon the approach of enemies, leap to the ground, where they lie motionless for a short time. This habit of jumping has given them the name of flea-beetle, but in many localities they are called "steely" beetles, owing to their color. This insect is known to science as *Haltica chalybea* Illiger. The feeding by these insects (Fig. 440) usually kills all buds attacked, which means the loss of the fruit that normally would have developed from these buds. Vines, however, are seldom killed by this feeding. The new buds which later develop produce foliage and shoots, but practically no fruit. Feeding occurs during the warmer days of May and June, and mating is frequent.



FIG. 441.—EGGS OF GRAPEVINE FLEA-BEETLE ON GRAPE CANE. (Enlarged.)



The eggs are orange in color, about four-hundredths of an inch in length, and of a cylindrical form. They are placed about the buds and in the crevices of the rough bark of the canes (Fig. 441). Most of the eggs hatch by the middle of June.

The larvae (Fig. 442) feed upon the foliage during the month of June and early July, and on reaching full growth crawl to the ground, in which they form cells and pupate. The adults (Fig. 443) emerge the latter part of July and usually seek the wild vines, upon which they feed. This late summer feeding makes it difficult to locate the beetles. The beetle enters hibernation rather early in the fall. The places most preferred are woodland and situations in which leaves and rubbish collect, but they also seek the shelter of rough bark of trees.



FIG. 443.—ADULT OF GRAPEVINE FLEA-BEETLE (Enlarged)

From such places they emerge with the warm days of spring and seek the vineyards. Only a single brood develops each season.

Control

Two periods in the life cycle of this species are favorable for control: (1) when the larvae are feeding and (2) when the adults appear in the vineyard in the spring. Spraying the vines with three pounds of arsenate of lead in 50 gallons of water when the larvae are feeding on the foliage is a very effective method of controlling this pest. If the adults appear in the vineyards in the spring, the most practical method of control is hand picking. This is accomplished by knocking the insect into a pan containing a shallow layer of kerosene. This method is cheaper than spraying with poison.

The destruction of all wild vines near a vineyard will usually give immunity from this pest.

THE ROSE CHAFER

Appearing when the grapes begin to blossom, and feeding largely upon the blossom and newly set fruit, the rose chafer (*Macrodactylus subspinosus* Far.) is able to do an immense amount of damage to the crop. The injury is usually very important, since this pest appears in great numbers in infested areas. However, it does not weaken or kill the vine. Vineyards situated on or near sandy soil are most liable to be infested, because the larvæ live only in the lighter soils.

The adult rose chafer feeds on a large variety of plants, but is especially fond of blossoms of the vine and the rose. It also feeds on the young fruit of the apple, peach, plum, and cherry. After feeding on the grape blossom for nearly a week it migrates to the blossoms of the staghorn sumac, red osier, and elder. The larvæ feed entirely on the roots of grasses, being partial to the foxtail, timothy, and blue grass. Sometimes the larvæ are found feeding on such grasses in neglected vineyards, but they usually inhabit grass fields and waste land.

Life History

The beetles emerge as adults (Fig. 444) during June, and, after feeding but a short period, begin to mate; but egg-laying does not occur until the insects have fed nearly two weeks. The females burrow into the soil and there deposit from a few to twenty-five eggs. These eggs hatch in about ten days and the young larvæ feed during the summer and autumn on the roots of the grasses. These grubs resemble the earlier stages of the white grub (Fig. 445) and have never been found feeding on the roots of grapes. They are seldom



FIG. 444.—ADULT ROSE CHAFER
(Enlarged)

found deeper than six inches while feeding, but as cold weather approaches they burrow deeper to avoid the severe cold. Early in

the spring they come nearer the surface and resume feeding. During the latter part of May these grubs form cells and change to pupae, emerging as adults about the middle of June of a normal season. The adults usually appear about the time the Concord grape begins to bloom.

Control

Three methods of control have proved effective against this pest: namely, (1) the destruction of the larvae, (2) cultivation to kill the pupae, and (3) spraying to kill the adults.

Inasmuch as the larvae feed on the roots of grasses and are found only on sandy soil, it is easy to locate their feeding ground and, unless the land is inarable, plant it to crops which will require cultivation during the season. This will destroy the grasses and the larvae will perish.

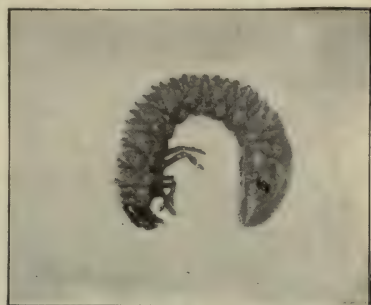


FIG. 445.—LARVA OF ROSE CHAFER (Enlarged)

When the grubs have changed to pupae, they are easily killed by thorough cultivation, which will break the cells and crush many pupae, thus preventing the emergence of a large percentage of them.

The best results in spraying to control this pest have been secured by the use of sweetened arsenical sprays. Spray as soon as the beetles appear, using arsenate of lead, 6 pounds; molasses, 1 gallon; water, 100 gallons. Make a second application, if necessary, one week later. Care should be exercised to avoid applying the spray previous to rains, because the molasses destroys the adhesion of the arsenate of lead. If a rain occurs within thirty-six hours after spraying, it will be necessary to repeat the application as soon as weather conditions permit.

THE GRAPE LEAF-HOPPER

No insect is more common in the vineyards of this state than the grape leaf-hopper (*Typhlocyba comes* Say.). Many growers erroneously call these insects the grape "thrips." The injury to

the vines vary with the season and the locality. In the Chautauqua region it is seldom that they are present in numbers sufficient to inflict damage over an extended area, past records indicating that this occurs about once in every eight or ten years. In the other grape regions of the state they are more abundant each season, considerable injury occurring to the vineyards and during shorter periods. In individual vineyards, especially those near favorable hibernating places or in close proximity to the spring food plants of this insect, serious injury may result for a number of seasons in succession. The spring food plants most preferred are strawberry, raspberry (both red and black), and blackberry.

FIG. 446—NYMPH OF
GRAPE LEAF-HOPPER
(Fifth instar; enlarged)

The insect obtains its food by piercing the epidermis on the under side of the leaf and sucking the sap. Additional injury is caused by the insertion of the eggs underneath the skin of the leaf. All such punctures decrease the starch-producing area of the vine, which results in decreased production of wood and in a decided lowering of the quality of the fruit.

Life History

The eggs are deposited during the month of June and early July. Those first deposited hatch from June 15 to the end of the month, but the majority hatch by about the tenth of July. The young leaf-hoppers are known as nymphs and resemble the adults in form, with the exception of having no wings (Fig. 446). These nymphs reach the adult stage (Fig. 447) during August; many of them mate and eggs are laid, from which a second brood develops. Individuals of the second brood reach maturity about

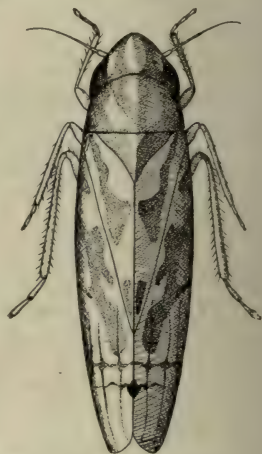


FIG. 447—ADULT GRAPE
LEAF-HOPPER
(Enlarged)

the middle of September. Usually only one brood is produced each season. The leaf-hoppers which become adults during the latter part of July or later feed on the foliage until autumn and then seek winter quarters.

The only stage of the grape leaf-hopper known to pass the winter in this state is the adult. They seek fallen leaves and grass which has lodged, and under such protection pass the winter (Fig. 448). It is necessary that such places be comparatively dry and free from inundation if the insects are to survive. It is for this reason that we find sandy ridges and knolls most favored by them. Emergence from hibernation occurs during the warm days of spring, after which the leaf-hoppers seek their food plants. Upon these they remain until the foliage of the grape has expanded, when they migrate to this, mate, lay their eggs, and die.

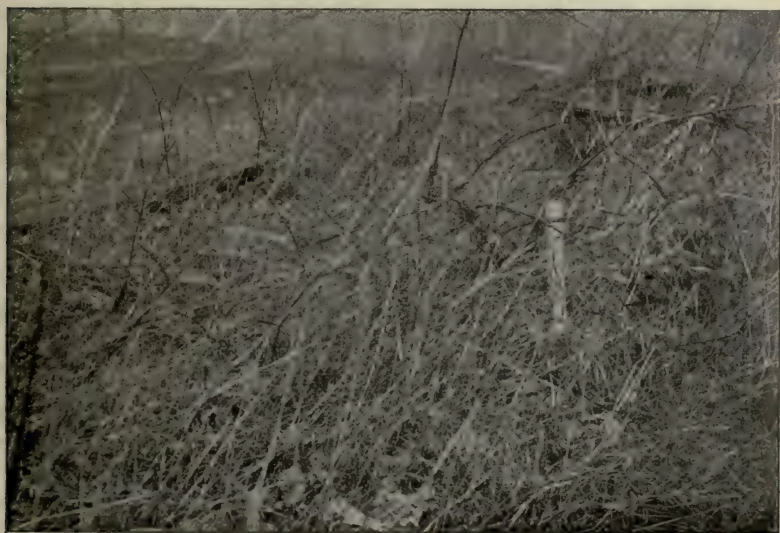


FIG. 448.—CONDITIONS FAVORABLE FOR THE HIBERNATING OF GRAPE LEAF-HOPPERS

Control

Two methods of control are effective against the grape leaf-hopper: (1) spraying with contact insecticides; (2) destruction of the hibernating places. The only spray that is effective is one

that reaches the body of the insect, and therefore the aim must be to spray so as to kill the nymphs before they have developed their wings. This is accomplished by applying the spray to the under side of the foliage, between July 10 and 15 of a normal season, using a spray containing .02 per cent of nicotine ($\frac{1}{2}$ pint of Black-Leaf 40 to 100 gallons of water or bordeaux mixture). The application to the under side of the foliage is accomplished either by means of trailing hose or by an automatic grape leaf-hopper sprayer. (See Geneva Experiment Station Bulletin No. 344 for description of machine). This will kill the majority of the brood, although a few eggs may hatch later and a few of the earlier appearing individuals may have developed wings. Sprays applied either earlier or later than the above dates will not have the maximum efficiency.

This method of control means that the vineyard having a serious infestation will be at the mercy of the adults during the spring and early summer, and considerable injury may result to the foliage. Injury to the more permanent foliage can be largely avoided by allowing the shoots which spring up around the base of the vine to remain until just previous to the time of spraying instead of removing them in June, as is usually done. The habit of the adults of flitting to the ground at the least disturbance of the foliage and their return to the lower foliage makes this recommendation feasible.

Clean Culture

Cover crops which remain green during the winter are of great benefit to vineyards, and fortunately these crops do not harbor grape leaf-hoppers. Weeds and many strong-stalked grasses, which die in the fall and lodge, offer excellent hibernating places. By avoiding such rubbish in the vineyard and by keeping grass patches surrounding vineyards closely mowed, almost perfect protection can be secured against these insects. The burning of leaves and rubbish in fence rows and waste places near infested vineyards during the autumn or early winter is recommended, thereby destroying all hibernating places.

THE GRAPE-BERRY MOTH

Grape clusters are often found having a number of berries injured by a dark-colored caterpillar. Such grapes are designated by the growers as "wormy." This caterpillar is the larva of the grape-berry moth (*Polychrosis viteana* Clemens).



FIG. 449.— INJURY TO FRUIT BY LARVAE OF GRAPE-BERRY MOTH, SHOWING CLUSTER AS TAKEN FROM VINE. NOTE UNSIGHTLY CONDITION

Part of the injury is caused by the caterpillars of the first brood, which feed on the stems and external portions of the young berries, but the greatest damage is due to the feeding on the inside

of the berries by the second brood of caterpillars. The loss to the grower occurs, first, by the loss of fruit; and, secondly and most important, through the marring of the clusters of grapes intended for table use and the cost of labor to pick out all worthless fruit.

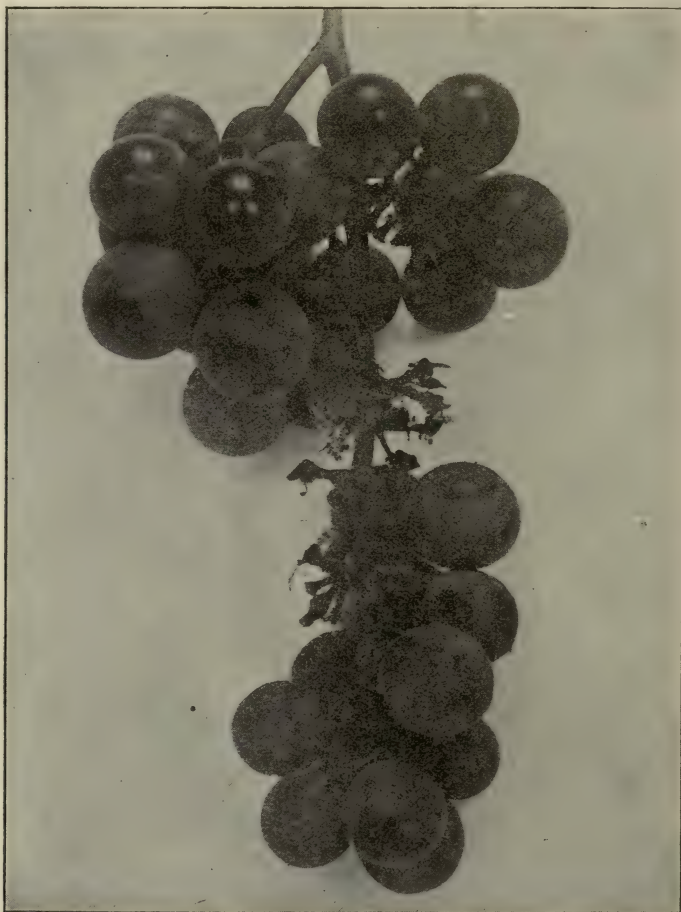


FIG. 450.—INJURY TO FRUIT BY LARVAE OF THE GRAPE-BERRY MOTH, SHOWING SAME CLUSTER AS IN FIG. 449 AFTER INFESTED FRUIT HAS BEEN REMOVED

Figs. 449 and 450 illustrate this point. The damage is very irregular, usually being most severe near woodland. In such areas often as much as 50 per cent of the fruit is destroyed.

Life History

The winter is passed in the pupal stage on leaves underneath the vines. About the time the grapes are blossoming, the moths emerge and mate, and eggs are laid on the stems, blossom clusters, and newly set fruit. When the caterpillars hatch they feed on the stems and newly set fruit, often webbing a number of the berries together (Fig. 451). Occasionally they will eat on the interior of a berry. After reaching full growth, these caterpillars cut out a portion of the leaf, drawing it into a pupal case by means of silken threads (Fig. 452), and here pupate (Fig. 453).



FIG. 451.—LARVA OF THE FIRST BROOD OF GRAPE-BERRY MOTH FEEDING ON EXTERIOR OF FRUIT (Enlarged)

The second brood of moths emerge during the latter part of July and August. Eggs are laid, and from these hatch the second brood of caterpillars, which live entirely in the berries. They often web several berries together, thus destroying much more fruit than is required for food. These larvae leave the berries about the time the fruit is ripe, form cocoons on the leaves, and hibernate.

The adult moths are small, having a wing spread of less than one-half inch. They are of a brown color curiously mottled with gray, and, when quiet, closely resemble the bark of the grape on which they rest during the brighter portions of the day. They are most active during sultry nights, although they fly during cloudy days and at dusk.

Control

The grape-berry moth is perhaps the most difficult insect of the vine to control, but by proper attention to details much loss may



FIG. 452.—LARVAE OF THE GRAPE-BERRY MOTH FORMING COCOONS, SHOWING TWO LARVAE IN DIFFERENT STAGES OF SPINNING WITH A COMPLETE COCOON BELOW (Enlarged)

be avoided. Spraying is most important just after the fruit is set, and the most effective material is bordeaux mixture, 4-4-50, to which have been added $1\frac{1}{2}$ pounds of soap and 3 pounds paste arsenate of lead. The greatest care must be exercised to cover

the fruit and stems thoroughly with the material. A second application, using the same material, should be made during the early part of August. Where a vineyard is only slightly infested, it often pays to pick and destroy the berries infested by the spring brood.

Plowing an infested vineyard, either late in the fall or early in the spring and paying particular attention to cover rather deeply all leaves immediately underneath the vines, then allowing this ground to remain undisturbed until the early part of June, will prevent the emergence of many of the moths. The centers of the rows may be cultivated during May, because the greatest number of pupae are immediately underneath the vines.



FIG. 453.—PUPAE OF THE GRAPE-BERRY MOTH. (Enlarged)

DISEASES OF GRAPES

DR. DONALD REDDICK

Professor of Plant Pathology, Cornell University, Ithaca, N. Y.



The early attempts at grape culture in the United States without exception were failures. It is now known that these failures were not due to uncongenial soil, as was believed at the time, but to the ravages of diseases which are much more destructive to European sorts than to those indigenous to America. The black rot disease, the downy mildew, and the powdery mildew are the diseases chiefly concerned. When these troubles were finally introduced into Europe they proved as destructive as they had previously been in European sorts grown in America, and it was only the very fortunate discovery of bordeaux mixture and its effectiveness against downy mildew that saved European viticulture from extinction.

Following the early failures with European varieties began the amelioration of American grapes, all of which are more resistant to the indigenous American diseases than are the European varieties. This difference in susceptibility is exhibited in hybrids between the two, and varieties having only one-eighth European "blood" almost invariably exhibit a marked susceptibility to those diseases. It should be remembered at the outset, then, that the pedigree of a variety will furnish an important indication of its probable susceptibility to disease.

BLACK ROT

This disease is very common in the Central Lakes region and in the Hudson district, but it rarely appears in the Chautauqua belt and, when it does, is not very destructive. The disease is caused by a fungous parasite, *Guignardia bidwellii*, which passes the winter in the hard black mummies on the dead tendrils, or on small dead areas on the canes. The disease first appears in the spring in the form of brown leaf spots about one-fourth inch in



FIG. 454.—BLACK ROT ON FRUIT OF NIAGARA GRAPE. EVERY BERRY IN THE CLUSTER IS INFECTED.

diameter, or as black oblong spots on the shoots, on the leaf petioles, or on the tendrils.

The fungus spreads from these spots by means of spores, which are produced abundantly and which are carried to fruit by spattering drops of rain. The fruit is quickly destroyed and only a hard black mummy is left.

The disease may be controlled by timely and thorough applications of bordeaux mixture. The first application should be made before blossoming and the second shortly after the blossoms fall. A high pressure should be maintained, and the nozzles should be set in such a way that the foliage will be covered. The nozzles should be fitted with replaceable disks having small holes in order that an exceedingly fine mist may be formed. These two applications are the most important, but in a rainy season at least two more applications should be made — one when the berries are the size of a pea and a later one just before the berries are large enough to touch each other. These applications should be made with trailing devices and the spray applied by hand, special effort being made to cover the clusters.

Bordeaux mixture, 4-4-50, is the most effective material known for this disease. It acts as a preventive, and, to secure best results, should be applied as indicated above whether the disease has appeared or not. The quantity of material applied per acre is not so important as is the evenness of distribution and fineness of the spray.

DOWNY MILDEW

This disease also is common in the Central Lakes region and in the Hudson River district. It can be found in the Chautauqua belt in such varieties as the Delaware, the Vergennes and the various Rogers hybrids. It has never been seen on Concord, the chief variety of the belt. As distinguished from black rot, the downy mildew is chiefly a foliage trouble and is in general less destructive than black rot. The disease is caused by a fungous parasite, *Plasmopara viticola*. This fungus passes the winter in fallen diseased leaves. Under moist conditions it passes, by means of spores, from the fallen leaves to all green parts. Brown spots a half-inch to an inch in diameter appear on the leaves, the tip of the shoot may be affected and increase in diameter, and the berries may be affected and develop a gray or brown rot. The chief



FIG. 455.—DOWNY MILDEW ON GRAPE FOLIAGE

The most conspicuous symptom of downy mildew is the large white spots appearing on the under surface of leaves. The fruit is sometimes attacked.

damage is on foliage, and the presence of the disease on leaves may be confirmed with certainty by inverting brown-spotted leaves and examining for a white, frost-like growth. Eventually the old spots spread or new spots develop and the leaf turns brown and dies, thus leaving the fruit sour and unripe.

The disease may be controlled by spraying as for black rot. Ordinarily the two early applications are sufficient to hold the disease in check, but in the case of early autumn rains the later application may prove of great benefit.

POWDERY MILDEW

This disease is common wherever grapes are grown, but is most destructive in the Chautauqua belt. The Rogers hybrids are especially susceptible to it, but the disease is of greatest importance because of its prevalence on the Concord. The disease is caused by a superficial fungous parasite, *Uncinula necator*. The fungus passes the winter on affected fallen leaves and perhaps also on the canes. It rarely becomes active until the middle of July or later, and often the first spots of the disease are not found until the middle of August. Small, grayish-white spots appear on all green spots of the vine. They are noticable first on the foliage. They increase in size and eventually cover the entire leaf. The presence of the fungus on the peduncle of the cluster is most serious, since it weakens the stem, which shrivels very rapidly when the cluster is removed from the vine.

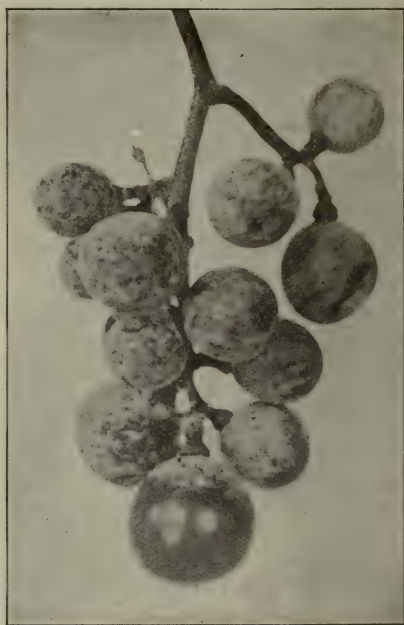


FIG. 456.—POWDERY MILDEW ON GRAPES

The fungus spreads over the berries and prevents their normal development. The lower berry is nearly normal. The pedicles and peduncles are also affected and shrivel very quickly after harvest.

The presence of the fungus on the peduncle of the cluster is most serious, since it weakens the stem, which shrivels very rapidly when the cluster is removed from the vine.



FIG. 457.— POWDERY MILDEW ON GRAPE FOLIAGE
Eventually the entire leaf is covered with the white powdery growth.

The disease may be controlled by the use of bordeaux mixture. The two last applications recommended for black rot are especially valuable.

DEAD ARM DISEASE

The dead arm disease is one of comparatively recent appearance. It is not found on European varieties; although, if introduced into Europe, it might prove very serious. The disease occurs in all parts of the state, but seems to be more common in the Chautauqua belt and on the Concord variety.

The disease is caused by a fungous parasite, *Cryptosporella viticola*. The fungus passes the winter in small black fruiting bodies on the dead parts of affected vines. In the early spring it spreads by means of spores to the young shoots, and later in the season to nearly matured berries, producing a black rot. The spots on the shoots are small, black, and oblong. The fungus passes slowly into the wood, and, if the shoot is not cut off too soon, gains entrance to the arms or trunk of the vine. A slow dry rot follows, the vine showing evidence of this condition by the small leaves, often yellowish in appearance and crimped about the margin. Eventually the vine dies.

The disease may be controlled by marking affected vines when the first symptoms appear and removing them at pruning time. Suckers brought up from beneath the surface of the ground almost invariably develop into strong, healthy vines. The first application of bordeaux mixture recommended for black rot is valuable in protecting the shoots from infection.



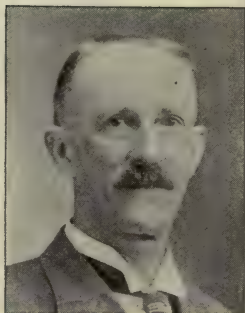
FIG. 458.—CHARACTERISTIC APPEARANCE OF VINE AFFECTED WITH DEAD-ARM DISEASE

PRODUCTION AND MARKETING OF GRAPES IN THE CHAUTAUQUA BELT

S. J. LOWELL, FREDONIA, N. Y.

Master, New York State Grange

FOUNDATION OF THE INDUSTRY



In considering the history of the grape industry in the Lake Erie Valley from the marketing or financial viewpoint, we are at once confronted with the fact that the advent of certain varieties was the foundation for a remarkable increase in grape culture. Until about 1865 a few grapes had been grown, such as Catawba, Isabella, Iona, Diana, and Clinton, these being used mostly for wine.

The advent of the Concord was the factor that at once gave impetus to the growing of grapes as a successful and standard branch of agriculture. Of the Concord, I have this to say: When first introduced it could always be picked by the middle of September; but now, from the indiscriminate selection of wood for propagation and the removal of all growth of the previous year — large wood and small wood from weak vines as well as strong — this grand variety is slowly breaking down and reverting. The time is now ripe for the introduction of a new variety that will supersede the Concord. I know many will dispute this, and I hope they may, in order that the fact may be brought more forcibly to the minds of propagators of the grape.

About 1885, Mr. Jonas Martin, of Brocton, sent out the offer that he would pay five dollars each for every cluster of Concord grapes that should weigh a pound. With visions of easy money the writer started for the Martin farm with a shoot bearing three clusters, the three weighing three pounds and two ounces. On his arrival he found that three or four early birds had already appeared and that Mr. Martin had withdrawn his offer. In

justice to Mr. Martin I should state that he paid for the first clusters delivered, and then corrected his idea that no clusters were grown weighing one pound each.

EVOLUTION OF PACKAGES

The first marketing of grapes from the Chautauqua grape belt was in the early sixties, and was done by wagon haul to the nearby towns. The packages were three- and five-pound-square boxes, packed in crates of twelve boxes to the crate. The fruit was packed in a tin container, and the first layer included the very best fruit that could be had. The clusters were clipped with shears so that the bottom layer would be level, smooth, and with no signs of stems. This container was made just small enough to slip into the wooden box. When it was full, the box was slipped on, turned over, the tin container pulled out, and there on top lay all the fruit first placed in the bottom of the tin, now smooth and well faced. Yet we often hear, "Oh, for the good old honest packing!"

The next package used was the round box, instead of the square one, but packed and crated in the same manner. This bore a fine, colored label that added much to the attractions of the package. The next was the twenty-pound splint basket, which was used in connection with the boxes. Then came into general use the twelve-pound basket, and the use of the boxes ceased. With the entrance of the Climax basket, a ten-pound container, the custom of selling by the basket became general; this was, I believe, in 1885. Previous to this all grapes had been sold by the pound.

The change was brought about largely by the fact that the growers believed the commission men were shrinking the weight of shipments, and the growers believed that if they could sell fruit by the basket they could do the shrinking at the initial end, and save the trade the bother. Many believe that they have done their work well. The nine-pound basket followed the ten-pound Climax basket, and the five-pound basket began to be used at this time, being soon followed by the use of crates for wine stock, which in turn was sold by the pound with the package weighed in. This led to immediate complaints that the package was too heavy;

in other words, the wine makers objected that they were buying too much wood with the fruit.

In order to correct this practice the 20-pound basket was again brought into use, this basket being a Climax basket with veneer sides, solid bottom, and splint hoops and handle, usually having an open splint cover.

This enumeration of containers does not include the modern sizes, and the changes have continued until at this time there are the three-pound, the four-pound, the four-quart, the eight-pound, and the 20-pound baskets.

UNIFORM STANDARD PACKAGES NECESSARY

Both national and state laws have been passed, but thus far they have not been conclusive or final, and have chiefly served to worry the growers without giving them any direct benefit so far as can be ascertained. It is to be sincerely hoped that the federal government will soon pass a law that will establish a clear standard for all packages, so that any one may safely ship fruit to another state without fear of being a lawbreaker.

Package standards should be based on cubic measure and not on weight, as no grower can ship fruit in easily opened containers without loss from sampling on the route, and from this sampling he may become technically a lawbreaker if the standard is on a weight basis. Fruit with large juice content, such as grapes, is also subject to losses in weight by evaporation, and even this might cause serious difficulty in a weight-basis standard. Certain standard sizes of cubic-measure contents should be made convenient to all, and growers would then gladly conform to the law. The weight standard is not possible with fruit, as shrinkage varies according to weather conditions. So much may be said for packages and the necessity for national legislation. Although but a detail of the business, it is nevertheless important.

PRIMITIVE METHODS OF SHIPPING

While the style and kind of packages has been changing, the manner of marketing — if this term can be used to designate it — has also undergone changes from time to time without much

regard to system. As I have stated, in the beginning all marketing was done by wagon, but the acreage began to increase as the prolific character of our soils and climate were better known, and the available markets within reach of wagons were not sufficient to consume the crop.

Express shipments were next in order, and the railroads did not take kindly to the traffic in grapes. I remember very well the time when growers were obliged to load the baskets on a truck at the station for themselves, to have it ready when the train pulled in, and to place the fruit in the car while the passengers were getting off and on the train, or else see the train pull out leaving them with a partly unloaded truck, when they would be compelled to wait until next day to load the remainder of the shipment. Under these conditions local express shipments were soon followed by shipping in local freight shipments, and then developed the full carload business on which the modern growth of the business is built.

EVOLUTION OF COOPERATIVE SELLING

Carload shipments required some kind of cooperation, and this was first accomplished by an agreement between the larger growers to ship and sell grapes for others at a charge of one-half cent a basket, thus obtaining enough to ship with their own fruit and fill solid carloads for distant cities. No sooner had this practice become established than complaints began to be heard that shippers were taking out more than the half-cent a basket agreed on, and that shippers were becoming rich.

During this time I remember an incident that will throw some light on how shippers began to send fruit to distant parts of the United States. A firm known as Martin & Ryckman asked how many persons would put grapes in a car to be shipped to Denver. Some said it would be foolish to think of such a thing, but finally a sufficient number came forward to supply grapes to fill a car. The writer furnished his share for the experiment. Then we anxiously waited to learn whether we had succeeded in adding to our markets or whether we should hear a shout from the croakers, "I told you so." The car did well. It was the initial act that enabled us to capture the markets of our country.

Complaints regarding the practices in the shipping of grapes continued until a united effort was made to consolidate the growers into one large corporation or shipping company. After some trials this was worked out in the following manner:

At a meeting held for the purpose a committee was appointed consisting of one grape grower from each school district in the grape belt. The work of the members of this committee was to canvass the belt and obtain signers to a petition asking for the organization of a company to handle the entire crop. Each signer was to take one share of stock, the shares being five dollars each. About ninety per cent signed to organize such a company. By-laws were then drawn up and a printed contract was sent to every one who had signed the petitions. About seventy-five per cent actually signed and paid for the stock, and the first large company was thus organized.

This company put out of business the men who had been shipping for one-half cent a basket, but some who did not want to lose so profitable a trade began to buy at the car doors, paying cash and taking the market risk themselves. Owing to the fact that they were small shippers, while the company was a very large one, they could select the best markets. On the other hand, the big shipping company, consisting of the growers themselves, had to use every market to dispose of its large crop, and this enabled the small shippers to outsell the large company. It so happened that many who remained outside the organization received more for their crops than did those who joined. They were not slow in making this known, and as a result many were drawn away from the company. From that time until the present day many plans have been advised, some of which have been tried out. As a result two facts are evident to the careful observer: first, that consumers desire better fruit, but do not wish to pay more for it; second, that the growers want to put in almost everything and still obtain good returns. The one extreme is just as unfair as the other.

BUYERS NOT WILLING TO PAY FOR QUALITY

For ten years, from 1900 to 1910, the writer was the manager of a shipping company that was formed to put up and sell a grade of fine table fruit. On every basket appeared this state-

ment: "These grapes are put up under contract for the Pomfret Fruit Co. and are guaranteed free from green, dirty, or mildewed fruit, and anyone finding anything wrong will please notify the company. Signed, John Doe, Grower."

Every complaint that came in had careful attention. If we were convinced that the fruit was not right, the money was refunded. Less than fifty complaints were received in the ten years. Every grower agreed to stand the loss if his name was the one given. Did it pay? No. The only advantage we gained was that our grapes sold first when the same price was asked.

One quotation from the many letters received will show just how it worked out: "Gentlemen: I have been looking for your fruit. I always buy it when I can get it at the same price asked by the others. Are you still selling grapes?" It shows that all love a bargain in fruit as well as in everything else. It ended by the growers putting in their baskets the same kind of fruit as all others did, for they did not feel that they could lose a quantity of poor fruit if the choice fruit was not appreciated by the buyers to the extent of at least breaking even when the poor fruit was left out. At present we have cooperative companies and cash buyers, which are about equal as to business done.

METHOD OF HARVESTING

Two methods of harvesting are used: first, picking in crates or trays, which are taken when full to the packing houses and allowed to stand until the fruit is wilted before being packed in the baskets for shipment; secondly, picking and packing in the field. The latter method is the cheaper, no doubt, but it is an open question as to whether the grapes arrive on the market in as good shape as when wilted before packing. Some companies have refused to accept the field-packed fruit.

POPULAR VARIETIES

The leading variety is Concord. Probably 95 per cent of all the grapes grown here are of this variety. Next come Worden, Niagara, Moore's Early, and Champion. Over one hundred other varieties may be found that are grown in an experimental way, but very few have qualities that make them of any value as a commercial proposition.

At the present time a large amount of energy is being devoted by the experiment stations and by interested individuals to the propagation of new varieties, and we can reasonably look for something good to be developed in the near future.

CULTURAL METHODS

Very little change has been made in the methods of cultivation of the grape since it was first grown here. We have many methods, but they are too numerous to detail, and they represent individual experience rather than any established standard. There are a few conditions, however, that have to be met by all, such as plowing away in spring, or using a disk, which amounts to the same thing. The question of how early or how late this operation should begin is a disputed point. The writer does not believe in too early cultivation. Later in the season, however, the better the cultivation, the better the results. The time to cease working the ground is another disputed point. To the careful observer who has had years to study, these two conclusions seem to be fairly proved. The first is that in a wet season late cultivation has been found detrimental to the developing of good, sweet fruit. The second is that in a dry season late cultivation may be of benefit; if very dry, it may prove a great benefit. As the grower cannot know what the future has in store, the best growers have a rule they follow year after year; the large majority cease all soil work the last of July or very early in August, believing that more injury is done in wet seasons than benefits are gained in dry ones by a later working of the soil.

A few years ago the cover crop was a thing almost unknown; it is now slowly being adopted throughout the belt. Its usefulness is accepted by all, the disputed point merely being the kind of a cover crop and how it may be best handled. The writer favors oats or barley, first, because the seed cost is light, about one bushel of either to the acre being sufficient; secondly, because either makes sufficient growth to catch all the leaves from the grape vines — an important factor; thirdly, they endure a rather hard freeze and remain standing, thereby holding the snow well; fourthly, they do not grow in spring. The last I believe is their strongest point. They form a cover to the land when they die

down during the winter, and prevent erosion of the soil. This brings us to the question of early and late plowing in spring.

I like to begin cultivation as late in spring and cease as early in fall as possible. The cover crops suggested make this practice successful. They can be sown the latter part of July and make growth enough to hold the soil through the heavy fall rains, making no growth in spring, so cultivation may be delayed into May. If such a cover crop is grown, grapes seem to be freer from berry moth than if legumes are grown.

METHODS OF PRUNING

Pruning is done in about as many ways as men have minds, most using the arm system as a foundation. This system should be called "the Chautauqua," as it was first used here. There are other systems, all of which are explained in cultural methods for the grape in New York on page 1272.

ESSENTIAL CLIMATE FOR GRAPE CULTURE

Many persons wonder what makes this Lake Erie Valley such a wonderful place for grape production and attribute it to the soil, but the climate is the real secret of its success. There are two essentials for profitable grape culture: first, water to prevent frosts; secondly, air drainage. In the Lake Erie Valley these qualifications have produced a dry atmosphere; there are no foggy mornings and very little dew, and only three frosts have occurred in the last fifty years that have done damage to the grape crop. In this belt we have harvested grapes every year of this fifty years varying from fifty per cent to a full crop.

MAGNITUDE OF THE INDUSTRY

The crops harvested have been from four or five thousand to between eight and nine thousand carloads a year. The bumper crop was grown in 1896, when nearly nine thousand carloads were harvested. This, it will be remembered, was a panic year, and the growers of grapes went into competition with one of the largest apple crops ever harvested, a policy that proved detrimental to both. In that year the grape growers lived on hope,

almost every one hoping the other fellow's crop would be lighter the next year. All saw their hopes realized.

All will want to know what this fruit is bringing in cash to the growers and the consequent effect on the value of local real estate. The figures have not been completed for the crop of 1915. For the year 1914, however, the value of the crop was about \$2,600,000, and the figures will not vary greatly from that for the past year.

Nothing has been said about the wine and grape-juice factories which have been built in this vicinity by reason of the grape crop, as they are taken up in articles on pages 1246 and 1268. As to the price of land here, conservative men put it from two to three hundred per cent increase, many farms having been sold for much more than that. By reason of climatic conditions grapes will never be grown except on a very limited area, since they are too costly a proposition if late spring frosts are likely to take place. For that reason we do not foresee that there will ever be much danger of an overproduction.

Men who have traveled widely for years are unanimous in their opinion that there is no more beautiful region in existence than on the shores of Lake Erie, and when the October air is filled with the perfume of the ripened grape, the health-giving qualities of which have been known since the days when our Savior drank of the fruit of the vine, we feel that this is the land of opportunity.

HYBRID GRAPES AT GENEVA

R. D. ANTHONY

Associate Horticulturist, New York Agricultural Experiment Station,
Geneva, N. Y.

PIONEER EXPERIENCE



One of the first things which impressed the early explorers and colonists along the Atlantic coast was the abundance of wild grapevines. The name Vineland, given to part of this coast by the Norsemen, is an illustration of this. Yet, when these wine-loving people planted their vineyards, they used cuttings or seeds of *Vitis vinifera* brought from their native homes in England, France, Spain, and Germany. Compared with their own native grapes, the small size of our wild grapes and their frequent lack of that clear flavor so desirable in a wine grade made them seem unworthy of planting. For the next hundred years, the history of these plantations of European sorts is one long series of failures and discouragement. Even in the hands of the most expert vineyardists, the vines soon sickened and died, and no variety could be found which could live under the adverse conditions of the new country until about 1800, when the Cape or Alexander grape was planted in a few vineyards. This, though a native, was deceptively introduced as a *Vinifera*, and marks practically the beginning of American grape growing.

RESULTS FOLLOWING THE INTRODUCTION OF THE ISABELLA AND THE CATAWBA

The marked success of the Alexander and the fortunate discovery of the Isabella and the Catawba, two other native kinds, revived interest in grape growing. The realization of the possibilities in our native species started many vine enthusiasts searching the woods for the better sorts and also growing native seedlings on a more or less extensive scale. Although this resulted in the production of the Concord, but little else of value was secured.

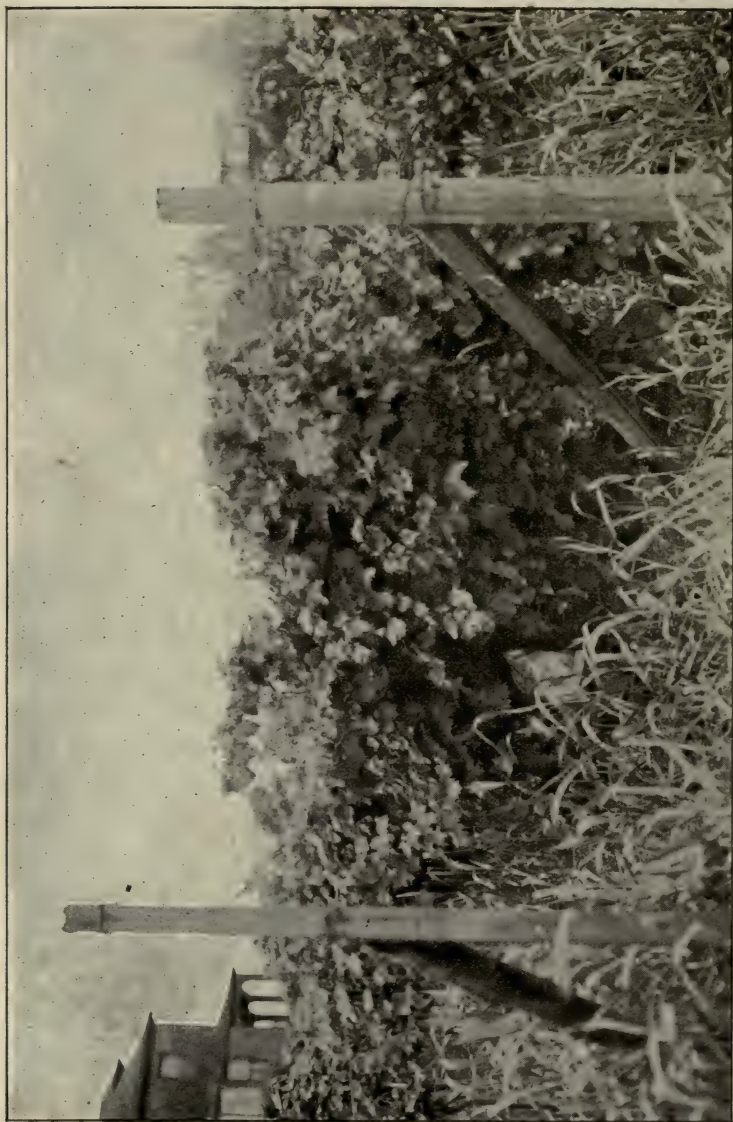


FIG. 459.—VINES OF *VITIS VINIFERA*

It was fifty years after the introduction of the Cape grape that the next important development came. Amateurs still continued to grow *Vinifera* grapes in a limited way, and mainly under

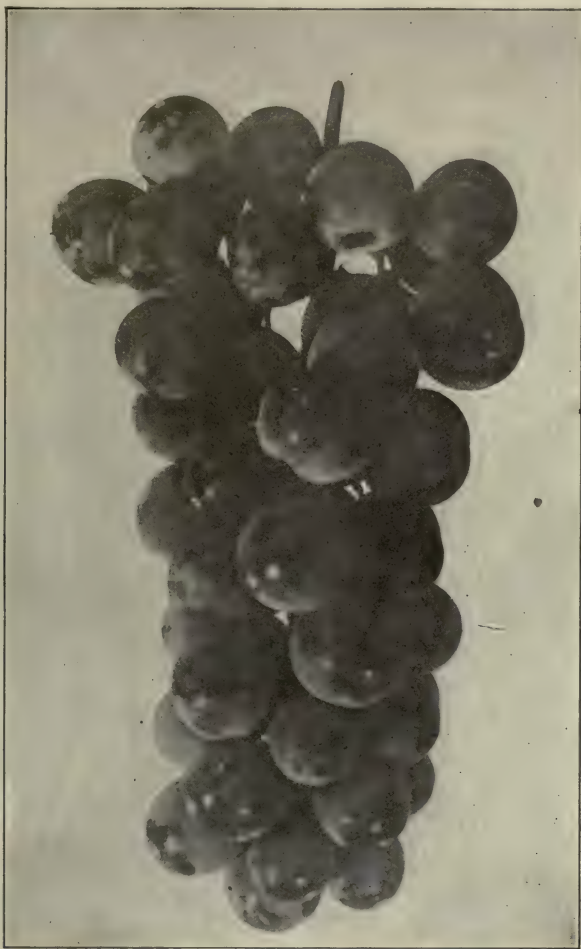


FIG. 460.— SECRETARY — SECURED BY CROSSING CLINTON, A NATIVE, AND MUSCAT HAMBURG, A *VINIFERA* VARIETY

glass. With these grapes at hand, the idea very naturally occurred to several persons to cross this blood upon our native species. Previous to 1850 both Valk and Allen had used *Vinifera* blood in breeding, but their results were not promising and attracted

but little attention. In 1851, C. S. Rogers of Salem, Mass., used the pollen of two *Viniferas* upon the pistils of a cultivated *Labrusca* and secured forty-five hybrid seedlings. Of those, thirteen were given names, including such well-known kinds as Salem, Lindley, Agawam, Herbert, and Wilder. His success led many enthusiastic amateur breeders to follow his example, and to develop not only hybrid seedlings but to cross our native sorts among



FIG. 461.—THE VINIFERA VINEYARD

themselves. In the fifteen years following the dissemination of Rogers' seedlings, nearly one quarter of all the varieties now cultivated in northeastern United States were first introduced. Although many of the *Vinifera* hybrids proved disappointments because of lack of vigor or productiveness, nevertheless there is scarcely a grape of high quality which does not possess some blood of this species, and it is in quality especially that the introduction of these hybrids has been epoch-making.



FIG. 462.—MUSCAT HAMBURG

After this auspicious start, the last sixty years have been a disappointment from a breeding standpoint. Concord and Catawba, poor as they are, still remain among our most important commercial varieties; and few, if any, of the many *Vinifera* hybrids have surpassed Rogers' first attempts. This has been largely because the work has been done in a limited way, without plan, and with very little knowledge of the varieties which have been used as parents. The rediscovery of Mendelism and the light which has been thrown upon the laws of inheritance since then have shown breeders the necessity of a thorough knowledge of the fundamentals before any considerable success can be hoped for. To gather such information requires years of painstaking effort and the study of a large amount of material.

RESULTS OF EXPERIMENTS OF A QUARTER-CENTURY

For twenty-five years the Experiment Station at Geneva has been breeding grapes on an extensive scale. Much of the work has been with our native sorts, but the principles developed with these will apply equally well with the European grape. Recognizing the value of *Vinifera* blood in imparting high quality, it was thought advisable to attempt growing varieties of this species on the Station grounds at Geneva. In the hundred years which had passed since extensive attempts to grow this grape had been given up in favor of the native species, science had shown that the chief causes of the early failures were from mildew, from a root-sucking louse which destroyed the *Vinifera* roots but seldom injured the native roots, and from inability to withstand the severity of our winter climate without special protection.

Early in 1911, cuttings of nearly one hundred *Vinifera* varieties were secured and grafted upon native vines that were from four to eight years old, thus avoiding trouble with the root louse. These vines have been well sprayed, and every fall they have been bent to the ground and covered with a few inches of dirt. With these precautions many of the vines have given results equal to or surpassing our native kinds. The work of crossing the most promising ones with our own best sorts began in 1912, and there are now over five hundred and fifty direct hybrids in the Station's vineyards and nurseries. It is, of course, too early to say what

the results of this work will be, but every indication points to probable success.

The work with *Vitis vinifera* has not been confined to the making of direct hybrids only. The best of the hybrids produced by

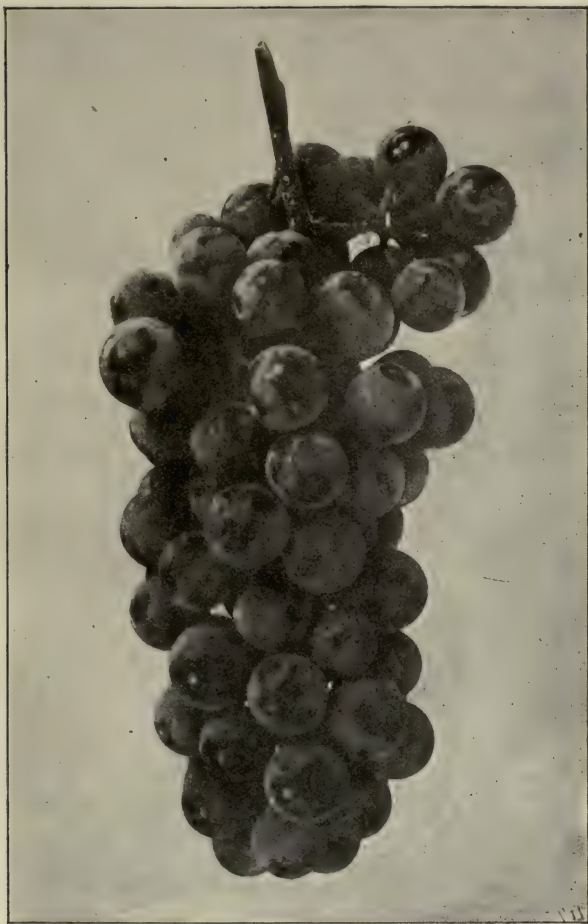


FIG. 463.—CLINTON

Rogers and subsequent workers have been crossed among themselves and with pure native sorts, and it is significant that from more than six thousand seedlings which have fruited, practically the only ones showing promise are those which contain some *Vinifera* blood.

Perhaps it would not be wise to close this paper without a word of encouragement to the amateur breeder. The private grower cannot hope to carry on this work to the extent and with the continuity that can be secured at an experiment station. On the other hand, practically every variety now under cultivation has been found or produced by the lover of grapes working in a small way, frequently as Rogers worked, with only a backyard at his disposal for growing his seedlings. For the true grape lover the pleasure of the work is its own reward, but there is always the hope that a fortunate combination of parents may produce varieties superior to those now under cultivation. Each addition to our knowledge of varieties and of breeding laws brings this end so much nearer.

TABLE SHOWING THE NUMBER OF VINES AND PRODUCTION IN POUNDS OF GRAPES IN NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Vines</i>	<i>Pounds</i>
Albany	8,782	85,381
Allegany	857	17,822
Broome	4,922	94,653
Cattaraugus	180,292	1,525,123
Cayuga	56,113	661,826
Chautauqua	15,782,646	132,029,939
Chemung	3,579	50,273
Chenango	2,041	52,073
Clinton	770	12,923
Columbia	364,674	3,482,633
Cortland	1,026	20,316
Delaware	1,295	30,666
Dutchess	72,594	585,356
Erie	1,141,278	10,638,840
Essex	14,116	57,579
Franklin	314	5,761
Fulton	684	14,001
Genesee	8,060	165,429
Greene	13,139	116,328
Hamilton	1	25
Herkimer	971	30,946
Jefferson	2,337	22,539
Kings	99	800
Lewis	174	1,197
Livingston	95,909	721,430
Madison	13,790	202,800
Monroe	188,477	2,138,752
Montgomery	8,612	81,787
Nassau	1,139	18,275
New York	23	320
Niagara	358,312	4,065,201
Oneida	6,049	114,405
Onondaga	47,149	630,767
Ontario	1,831,644	11,155,951
Orange	200,733	1,698,745
Orleans	38,321	565,904
Oswego	8,891	160,299
Otsego	1,265	37,272
Putnam	2,134	12,060
Queens	854	8,754
Rensselaer	10,468	137,315
Richmond	730	5,080
Rockland	5,513	67,015
St. Lawrence	833	15,564
Saratoga	4,907	69,681
Schenectady	2,398	29,885
Schoharie	2,869	58,282
Schuyler	923,263	5,253,621
Seneca	561,869	6,157,171
Steuben	2,568,026	17,509,702
Suffolk	5,265	72,849
Sullivan	3,593	61,549
Tioga	2,607	56,413
Tompkins	71,922	550,090

<i>County</i>	<i>Vines</i>	<i>Pounds</i>
Ulster	1,969,301	13,358,000
Warren	1,165	23,117
Washington	2,618	63,126
Wayne	65,076	1,083,859
Westchester	5,511	120,526
Wyoming	6,525	57,197
Yates	5,123,572	36,941,168
The State	<u>31,802,097</u>	<u>253,006,361</u>

THE STRAWBERRY

"Doubtless God could have made a better berry, but doubtless He never did."

IZAAB WALTON

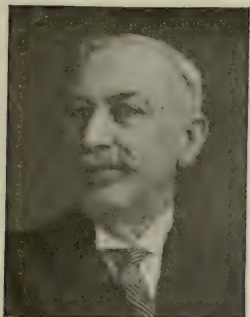
[1341]



PROLIFIC

STRAWBERRIES

WILLIAM PALMER, REXFORD, SARATOGA COUNTY, N. Y.



The strawberry is one of our best berries, enjoyed by nearly everyone, and should be grown by all who have even a small piece of ground. As it grows well on nearly all kinds of soil, it should not be considered a berry for the commercial grower only; it can be grown well by people living in villages and cities who have a back yard and small garden, so that fresh strawberries can be had all through the season.

STUDY VARIETIES

When beginning to grow strawberries, it is well to look over the line fence and see what varieties are doing best for your neighbor. As all varieties do not succeed well in all soils and locations, it is well to try several varieties in a small way, growing them under the same conditions. Usually one or more varieties will do better than the others, showing which are best to plant. Do not draw your conclusions too early, but give them two or three years' trial before casting aside the unworthy ones.

The writer has grown more than one hundred and fifty varieties of strawberries; but, as a very large percentage of them were found to have no profit and some but very little merit, they were discarded. In all locations it is well to test varieties, as it is quite important that the variety succeeds well on the soil. I do not know of any one variety of berry so prominent in the strawberry family as the Baldwin apple is in the apple family. The strawberry is rather sensitive, and must be located in a favorable home. The principal varieties, as grown in Saratoga, Albany, Rensselaer, Schenectady, and Montgomery counties, are the following: for early varieties, Michel's Early, Excelsior, and Bederwood; midseason, Sample, Wm. Belt, Splendid, and Brandywine; late, Gandy and Stevens' Late. A good supply of staminate plants should be set with the pistillate varieties.



FIG. 464.—ORCHARD OF 2,200 TREES — PEARS, PLUMS, AND PEACHES — INTERPLANTED WITH STRAWBERRIES

SOILS AND CULTURAL METHODS

The strawberry succeeds best on a good sandy loam containing plenty of humus, so that it will hold moisture. If the land is in sod, in order to grow in a commercial way it should be plowed and sowed to buckwheat the season previous to setting the berries. I prefer buckwheat to any other crop as it seems to clear the ground of weeds. The following spring (I mention spring because I have found that to be the best time to set the plants) the ground should be given a liberal covering of manure. If the manure is strawy, it should be plowed under; but if well-rotted it should be spread on top after plowing. Disc well before harrowing. The ground should be well drained and have a smooth surface so that there are no basins in which the water can stand. After harrowing, use a plank leveler or a light roller to pack down and smooth the surface; it will help to hold the moisture and make setting the plants much easier.

The matted row is the best for a large field of berries, the rows being four feet apart and the plants eighteen to twenty inches apart in the row. The cultivator should be started as soon as the plants have been set. At the second cultivation a liberal supply of commercial fertilizer should be scattered along the rows, and then worked into the ground around the plants with a hoe. The cultivator should be kept running through them once in two weeks; oftener would be better. Narrow the cultivator as the laterals commence to run; continue narrowing and continue to use the cultivator to the end of the growing season.

MULCHING

As soon as the ground is frozen hard enough to hold up a team, cover the plants with straw or coarse manure. Should there be basins of water standing on the plants when the ground commences to freeze, bore holes three or four feet deep with a post-hole auger to let the water settle away; then they are ready for frost and winter. In the spring — not too early — remove the coarse part of the mulch from the plants and leave it between the rows so that it will keep the berries clean, also serving to hold the moisture. For extremely early berries, take off all the mulch; do this quite early, as it will hasten them to mature: for late

berries, leave all the mulch on, just so the crowns of the plants can grow through the mulch; this will make the berries ripen a week or more later. A piece of ground sloping to the north or northeast will also make later berries, and very often good late berries will make the profit on the season's strawberries.

INSECTS AND DISEASE

In this locality we have been rather fortunate in not having any serious disease or insect pest. The toughest enemy to fight is the white grub. It seems to be lying around waiting for the plants to be set, with its teeth well sharpened to eat off the roots. Many may be killed while hoeing or cultivating. Keep watch of the plants and, when the leaves commence to wilt, dig around until you find the little rascal; then put your foot on him good and heavy. This method must be followed up until the plants are well established, and the laterals commence to run.

HOW TO CHOOSE MARKET VARIETIES

For a select home or nearby trade, set plants or varieties that will, under good care, grow fine, large, high-quality berries, as such will sell for the high prices. If to be grown near a manufacturing city, set plants of heavy-producing varieties. They will not sell for the high prices, but will usually make up in the greater number of quarts.

PICKING AND MARKETING

As a rule, women make the best pickers. Use picking stands that will hold from four to eight baskets. On bright, sunny days the berries should be kept out of the sun as much as possible. If they are packed in crates, these should also be in the shade. If not taken to market at once, they should be carried to a cool building or cellar and set on the ground, so as to keep them bright. Their appearance is extremely important in selling them. A clean, fresh-looking berry will always sell well on the market, while a dull-looking one will sell slowly and discourage the salesman.

The 32-quart crates are the best to use; some families use that quantity for canning. On the way to market be sure to cover the

crates with canvas or clean blankets to keep out the dust and heat. The selling prices of the berries depends very much on their appearance when they reach the place of sale. One lot will often sell for one cent per quart more than another lot of equally well-grown berries, and possibly all on account of the way they are carried to market.

The one who grows berries for profit should be sure to grow them well, and enough of them so that when he returns from market he will be smiling. Success depends upon well-grown and well-marketed berries; the two ends must meet and then there is pleasure in the business.

TABLE SHOWING ACREAGE AND PRODUCTION IN QUARTS OF STRAWBERRIES IN
NEW YORK STATE, BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Albany	226	394,877
Allegany	13	47,706
Broome	75	231,232
Cattaraugus	53	125,822
Cayuga	55	103,977
Chautauqua	247	551,125
Chemung	45	120,074
Chenango	18	39,115
Clinton	12	18,356
Columbia	309	851,946
Cortland	20	35,340
Delaware	16	36,650
Dutchess	160	490,816
Erie	596	1,659,635
Essex	12	22,273
Franklin	51	34,098
Fulton	38	135,165
Genesee	36	58,028
Greene	34	64,131
Hamilton	1	1,295
Herkimer	173	498,424
Jefferson	53	91,887
Kings	1	558
Lewis	21	42,624
Livingston	57	155,073
Madison	40	62,314
Monroe	396	1,103,390
Montgomery	21	45,515
Nassau	144	263,682
New York	9	50,900
Niagara	180	328,986
Oneida	113	269,840
Onondaga	149	412,545
Ontario	87	121,686
Orange	310	795,411
Orleans	53	92,569
Oswego	361	1,021,121
Otsego	37	73,772
Putnam	3	9,658
Queens	5	21,000
Rensselaer	185	516,003
Richmond	82	144,620
Rockland	67	110,121
St. Lawrence	34	41,388
Saratoga	110	251,470
Schenectady	62	111,777
Schoharie	7	11,232
Schuyler	28	51,266
Seneca	36	59,464
Steuben	58	150,646
Suffolk	108	224,332
Sullivan	8	18,623
Tioga	30	85,007

STRAWBERRIES

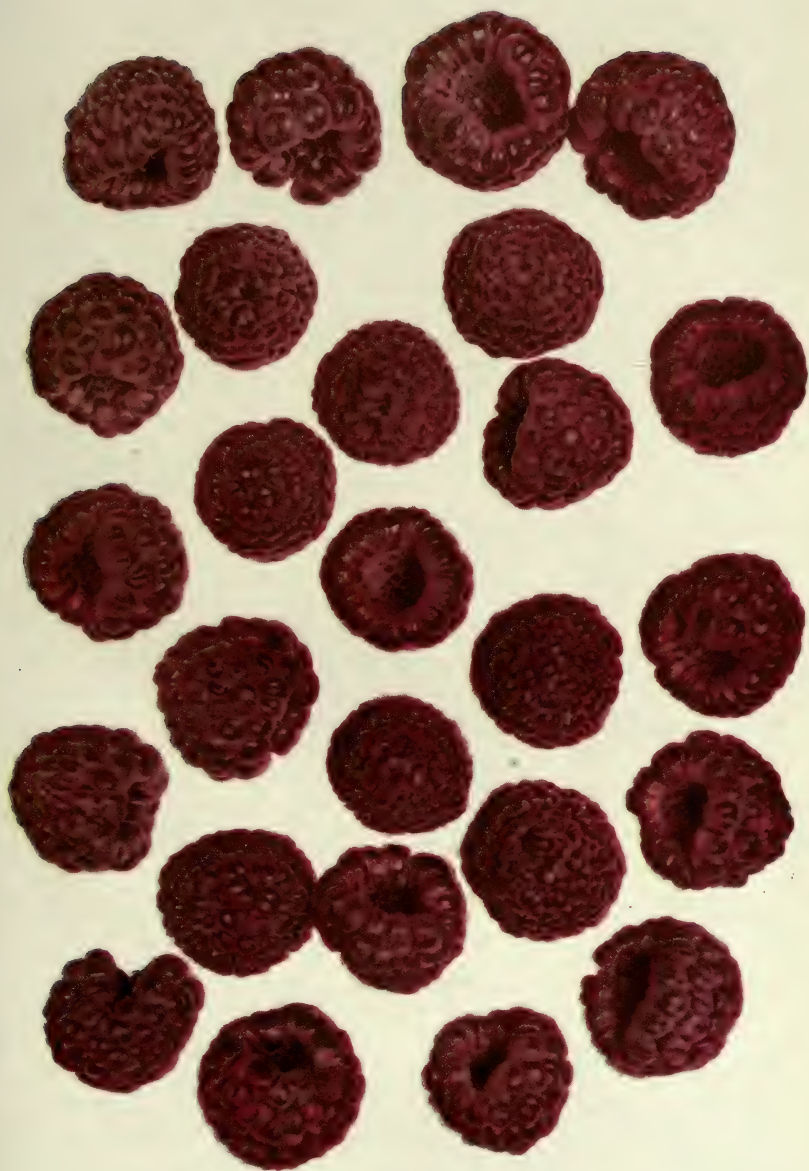
1349

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Tompkins	46	103,497
Ulster	895	2,791,601
Warren	39	69,820
Washington	38	90,200
Wayne	192	396,371
Westchester	61	125,691
Wyoming	25	42,825
Yates	41	67,293
State	6,382	15,945,863

THE RASPBERRY

*"Hither soon as spring is fled
Lurking berries, ripe and red,
Then will hang on every stalk,
Each within its leafy bower;
And for that promise spare the flower."*

WORDSWORTH'S FORESIGHT



JUNE

RASPBERRIES

O. M. TAYLOR

Foreman in Horticulture, New York Agricultural Experiment Station,
Geneva, N. Y.



Next in importance to the strawberry in New York State is the raspberry. The area devoted to this crop, 11,057 acres, is nearly equal to the combined area devoted to all the other small fruits; but the yield in quarts, 14,751,940, and its value, \$1,168,062, is slightly below the yield and value of the strawberry. New York ranks first of all the states of the Union in the area and value of raspberries. Unfortunately, there

are no figures available at present as to the different classes of raspberries, the red, black, and purple all being grouped under one heading in the last census.

The area for each county is given in the table on page 1367. Ontario, Wayne, and Yates lead, each with over 1200 acres, while the counties of Erie, Ulster, Schuyler, Monroe, Chautauqua, Oswego, and Niagara follow in order named, varying from 908 acres to 305 acres. Thus it will be seen that the three most important raspberry sections of the state are in the counties bordering Lake Erie and Lake Ontario, near the western group of the Finger Lakes in central New York, and in the Hudson Valley.

RED RASPBERRIES

LOCATION AND SOIL

The red raspberry closely follows the strawberry in season and is the most popular of the bush fruits. It may be grown in most locations and on many types of soils. In exposed localities, plants may suffer unless protected. Both a minimum distance to market and good roads are desirable, as the fruit is too soft for rough handling. Poorly drained soils and stiff clays should be avoided.



FIG. 465.—HERBERT RED RASPBERRY

Lighter, warmer soils, well stocked with humus and retentive of moisture, are preferable. Most of the plantations of western New York are on sandy and gravelly loams.

MANURE AND FERTILIZERS

Moderate annual applications of stable manure and commercial fertilizers are usually beneficial. Fertilizers rich in nitrogen should be used with care to avoid overstimulating the plants. The amount of plant food already in the soil is an unknown and variable quantity, and exact specifications as to kind and amount of supplemental fertilizers to be used cannot be given accurately. Such questions should be worked out on the different soils by trials of the different materials, using (1) 400 pounds acid phosphate per acre; (2) phosphate as above and 200 pounds muriate of potash; (3) phosphate and potash as above and 150 pounds nitrate of soda; (4) 8 tons of good stable manure. These should be applied in plats, leaving a plat unfertilized, similar in size and character to the others, as a check. Stable manure should be applied in November, during the winter, or in early spring, while commercial fertilizers should be applied early in the spring. Applications need not be so heavy as with currants or gooseberries.

PROPAGATION

Red raspberries are usually increased by digging up and transplanting the numerous suckers which develop along the plant row. A part of the root system should be dug with each sucker. The dormant tops are usually cut back to within a short distance of the root.

CULTURE

The best plants obtainable should be secured, and they may be set either in the fall or spring. The rows of plants set in the fall should be backfurrowed or the plants should be protected over winter. In the spring the plants should be set early. Summer planting is sometimes practiced, usually in May, the young suckers (four to eight inches high) being transplanted during cloudy or wet weather. Plants should be set slightly deeper than they grew.

The spacing of rows and plants depends on character of soil, on variety, and on the method of culture. Red raspberries are

usually set in rows six to seven feet apart with plants two or three feet apart in the row. Some growers prefer eight feet between rows to permit of cultivation with a team. The plants soon form a continuous row. If grown in hills, the plants are set about five feet apart each way.

Cultivation should begin early and be repeated often enough to maintain a mellow soil condition. After harvest the ground should be thoroughly worked and a cover crop sown, using either about fifteen pounds clover seed per acre or twenty-five pounds of vetch, or about one bushel of oats or barley. Mixtures of the seed are sometimes used to advantage. A hoed crop may be grown between the rows the first year. Cultivation close to the plants should be shallow.

The fruiting canes should be cut out and destroyed as soon as the crop of fruit has been harvested, thinning out the surplus canes the following spring to from four to six canes per bush, depending on conditions. No further summer pruning is required with red raspberries. In the spring the canes should be cut back to a desired fruiting height, usually three or four feet from the ground, depending on their vigor.

In most parts of the state no trellis is used, but in some localities the bushes are staked when grown in hills, or a wire trellis is used, stretching one wire on each side of the row. Red raspberries are usually sufficiently hardy to need no winter protection. In certain parts of the state, however, and with some varieties, the canes are given some degree of winter protection by bending them down and covering them more or less with earth or coarse, strawy mulching.

INSECTS

Fortunately, but few insects infest the red raspberry. The following are those most commonly found in various sections of the state.

Snowy Tree-Cricket

This insect makes a row of punctures about two inches long in the cane in which the eggs are deposited, when that part of the cane above the puncture either dies or is so weakened as to prevent the normal development of the fruit. The only satisfactory remedy is to gather and burn the infested canes containing the eggs.

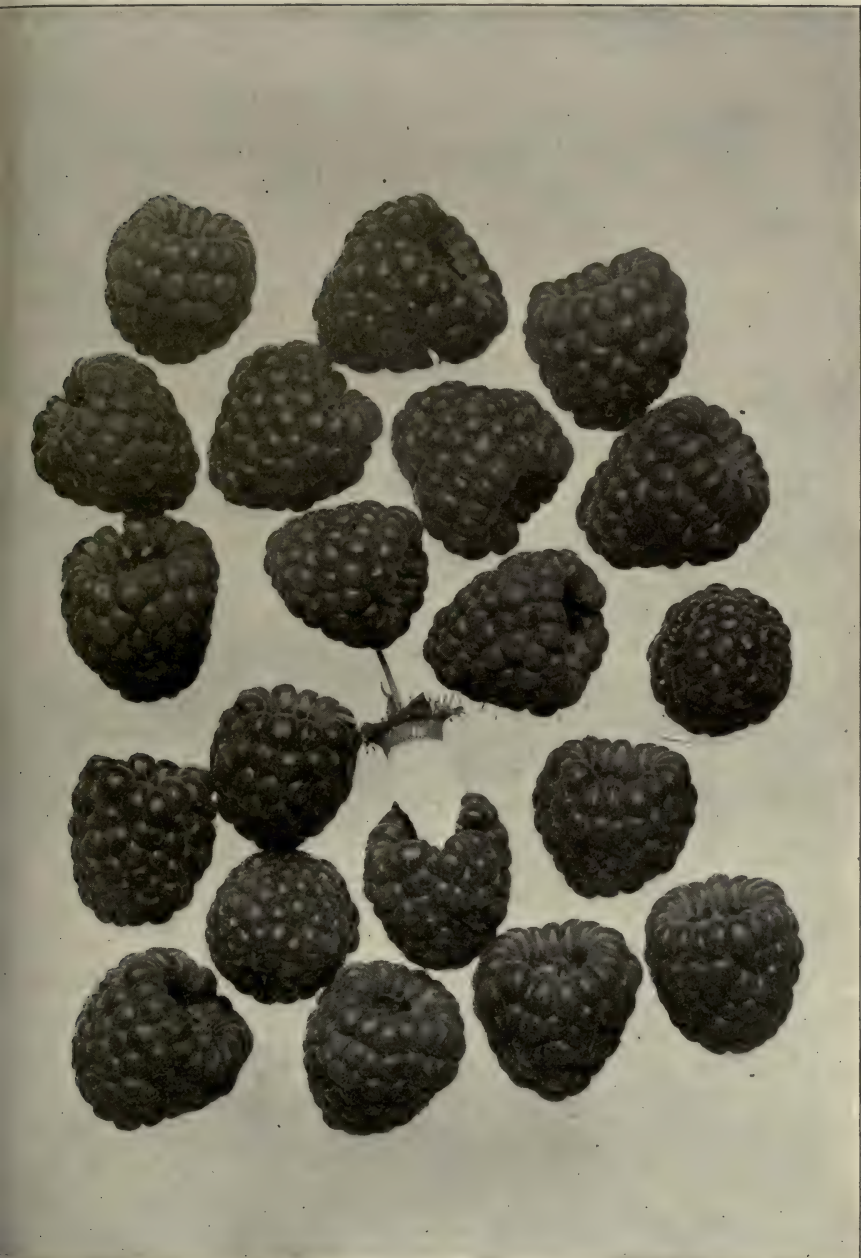


FIG. 466.—CUTHBERT RED RASPBERRY

Raspberry Cane-Borer

In June, eggs are laid singly by small beetles in the young shoots, about six inches from the tips of the canes. Two rows of punctures encircling the cane are made, one below and another above the egg. The girdling results in a withering or drooping of the ends of the young shoots. After hatching, the borer eats its way downward. The wilted tips should be cut off well below the girdled spot, and some of the older borers may be destroyed by cutting and burning the old fruiting canes as soon as the fruit has been harvested.

Raspberry Sawfly

Eggs are laid in May or early June within the tissue on the under side of the leaves by small, dark-colored flies. After hatching, the larvae eat away the leaf tissue. They are pale green, thickly covered with whitish spines. The larvae may be readily destroyed by arsenical sprays; or, if near harvest time, the plants may be dusted or sprayed with hellebore. In the latter case use one ounce of hellebore per gallon of water.

Red Spider

In dry seasons, small, yellowish-red mites are sometimes found in large numbers, infesting the foliage. A spray of soap and nicotine extract will kill all that are hit by the spray. Severe rains usually keep the mites in check so that they are not often numerous enough to require a spray treatment.

DISEASES

Cane Blight

The leaves wilt and the canes die as the fruit reaches maturity. The wood becomes discolored in large or small patches, often encircling the cane. Cut out and burn infested canes; set only healthy plants; remove fruiting canes at once after harvest; give the best of cultural treatment; make frequent renewals of plantations.

Yellows

Plants are dwarfish or stunted in growth, the foliage is a mottled, yellowish-green, and the fruit does not mature properly, becoming dry and insipid. The cause is unknown and no remedy suggested except renewal of plantations.

Root-knot or Crown Gall

This disease is especially destructive to red raspberries. Its presence is indicated by rough, knotty, swellings or bunches, usually at the surface of the ground or on the roots beneath. There is no satisfactory treatment. All infested plants should be discarded at planting time, and plants should not be set on ground known to be infested with this disease.

HANDLING AND MARKETING THE FRUIT

Red raspberries may produce anywhere from four to eight or ten good crops, depending on conditions. The berries are usually marketed in quart boxes which are placed in crates of various sizes, the average holding 32 quarts. Some markets, however, prefer the pint boxes. The fruit when picked should be fully ripe, but still firm. It deteriorates rapidly after picking, and should not be harvested while wet, as it soon becomes soft, dull in color, and loses much of its delightful flavor. Yields of red raspberries are usually less than those of the other bush-fruits. They vary from 1,400 to 2,000 quarts per acre, and the selling price varies from eight to sixteen cents per quart, a price higher than for the other bush-fruits.

VARIETIES

“Many are called, but few are chosen.” Most of the varieties available may be characterized by their faults. Few of them have any commercial value. Adaptation should be determined before planting largely, as varieties may succeed in one place and be failures in other locations. We may determine what varieties to set by observation of the kinds doing well in the immediate locality under apparently similar conditions, and by a trial of a few plants before setting extensively. The list given is only suggestive. It includes those of most importance in this state.

The June, a variety originating at the Experiment Station, Geneva, N. Y., is already assuming commercial importance in parts of the state on account of its earliness, large size, attractive appearance, and productiveness. Perfection, also an early variety, is popular in the Hudson Valley. Marlboro has long been the leading early variety, but its culture is on the decline. Herbert is a wonderfully productive variety, of large size, but somewhat

soft for shipping. Cuthbert is the best known and most widely planted of all varieties, and is the most satisfactory late red raspberry.

Cuthbert.—Late; most popular throughout the state; season long.

Herbert.—Late midseason; larger, softer, and more productive than Cuthbert.

June.—Very early; productive; long season; fruit large; ships well. The most valuable early variety. Originated at Experiment Station, Geneva, N. Y.

Marlboro.—Early; plants dwarfish; fruit firm, sometimes crumbles.

Marldon.—Season short, just before Cuthbert; bushes vigorous, very productive; berries large, attractive, bright red; a new, promising variety originating at Experiment Station, Geneva, N. Y. Disseminated in 1909. Plants soon available from nurserymen and growers.

Perfection.—Early; bushes stocky, productive; berries large, attractive red.

BLACK RASPBERRIES

LOCATION AND SOIL

The black raspberry is grown less extensively over the state as a whole than is the red raspberry, yet in certain counties, including Yates, Wayne, Ontario, and Monroe, it may be found in large areas. In some localities its culture is on the decline, owing to the ravages of the disease known as anthracnose. It is slightly less hardy than the red raspberry, but stands the wear and tear of handling and shipping much better than either the red or the purple raspberry. The soil requirements are quite similar to those of red raspberries. In western New York, however, its preference for the lighter soils is more marked than with red raspberries.

MANURE AND FERTILIZERS

The statements as given for red raspberries will apply equally well for the black raspberry. The root system, however, is more shallow, and the plants are more quickly affected by a lack of plant food or of sufficient moisture. The wood should be encouraged to mature early in the fall to withstand better the extremes of winter temperature.



FIG. 467.—KANSAS BLACK RASPBERRY

PROPAGATION

Black raspberries are propagated by means of tip-layers, and better plants are secured from two-year-old and three-year-old bushes than from yearlings or from the older plantations. The tips are usually ready for layering about the middle of August, depending on the season, at which time they begin to thicken. The tips take root readily if buried about three inches deep in moist soil. The tips are usually well rooted by the close of the growing season and are transplanted the following spring, severing the cane about six inches from the tip, thus leaving a convenient handle.

CULTURE

The culture of black raspberries is quite similar to that of red raspberries. Strong, healthy plants with a good root system are set, preferably in the spring. They are set rather shallow, especially in the heavier soils; or, if set in shallow furrows, should be covered lightly at first to avoid smothering the young buds, gradually filling in during the season as growth develops. The new shoots which start early should not be broken off during the process of setting the plants.

Black raspberries are set at slightly wider distances than the reds — 7 feet by $3\frac{1}{2}$ feet or from five to six feet apart each way. They seldom, if ever, develop suckers. Cultivation is similar to that for red raspberries but should not be deep enough to injure the shallow root-system; a hoed crop may be grown between the rows the first year, and cover crops should be used as with red raspberries.

Black raspberries require more severe pruning than reds. The old fruiting canes should be removed as soon as the fruit has been harvested. Additional summer pruning consists in stopping the new growth at a height of from twenty-four to thirty inches from the ground by removing or pinching off the succulent tip. This is done the last of June or in July. It will be necessary to go over the plantation several times to stop all the growth at the desired height. In the spring, the lateral branches which develop are shortened back from one-third to one-half their growth, depending on vigor and on the variety, and the canes are thinned out to from three to six per hill.

No trellis is used in most plantations; yet in some localities the two-wire trellis is used as described under red raspberries, page 1356. Winter protection is given in sections requiring such treatment, as the black raspberry is slightly more tender than the red raspberry.

INSECTS

The insects already described as attacking red raspberries — the snowy tree-cricket, raspberry cane-borer, raspberry sawfly, and the red spider — also attack black raspberries, and their discussion is given under red raspberries, pages 1356 and 1358.

DISEASES

Cane blight and yellows have been described under red raspberries, page 1358. In addition to these are the following.

Anthracnose

This is one the most serious diseases of black raspberries. Grayish-brown spots or patches develop on the plants, especially on the canes. Red raspberries are seldom attacked by this disease. The plants are greatly weakened, if not killed outright. Although bordeaux mixture is a preventive, the increased yield secured by spraying is usually not sufficient to pay for the cost of spraying. The following measures are suggested:

Plants should have a maximum amount of sunlight and air, and should not be crowded. Remove the old wood and the worst of the diseased canes soon after harvest. Make frequent plantings on fresh land, selecting only healthy plants for setting. Give the best of care, both in cultivation and in feeding the plants, to secure maximum results early in the life of the plantation.

Orange Rust

This is a most serious disease of both black raspberries and blackberries, seldom troubling red raspberries. The yellowish-green foliage, checking of growth, and the orange-red color of the under surface of the leaves are indications of the presence of the disease. The only treatment is to dig and burn infested plants as soon as the disease is detected.



FIG. 468.—GREGG BLACK RASPBERRY

HANDLING AND MARKETING THE FRUIT

The profitable life of black raspberry plantations cannot be accurately stated, but it is less than that of red raspberries. Disease or winter injury may cut it short. The plants often bear no more than four crops, although sometimes more, and are usually removed every six or eight years. Yields vary from 1,600 to 2,400 quarts per acre, averaging higher than those of red raspberries. The selling price for the fresh fruit is less than for red raspberries, averaging between five and nine cents per quart. The same rules that apply in harvesting red raspberries apply to black raspberries, although the fruit is firmer and will keep longer in good condition. It is usually handled in quart boxes. The season of black raspberries in western New York begins the first week in July, and is shorter than that of red raspberries.

The black raspberry is the only one of the small fruits which is evaporated to any great extent. The berries are picked by hand or are batted off the bushes into canvas tray harvesters after they become fully ripe. The yield of dried fruit per bushel of green fruit varies with the variety and the season. From two to four quarts of fresh fruit are usually required to make one pound of dried fruit, or, one bushel (32 quarts) of fresh fruit will make about ten pounds dried fruit. The price for evaporated stock varies from fifteen to twenty-five cents per pound. Six cents per quart for fresh fruit is considered a fair price in comparison with the amount received for the dried product.

VARIETIES

The method of determining what varieties of black raspberries to set is the same as with red raspberries. Much of the fruit, however, is evaporated, as well as being sold in the fresh state. If grown for evaporation, the variety should not only be productive, hardy, and healthy, but the fruit should be of fair size, should not contain too much moisture, should be easily batted from the bushes if that method of harvesting is used, should ripen the most of the fruit at one time, and should be firm enough and of such a color as to make a pleasing appearance after being evaporated.

The Ohio has long been a leading variety for this purpose, and the Kansas is also largely grown, both for evaporating and for

selling in the fresh state. Gregg is a good late berry of large size lacking in yield. In the western part of the state, Cumberland, Palmer, Kansas, and Diamond are the leading varieties. Plum Farmer has recently been planted with good results. The following list comprises the best known kinds of the state:

Cumberland.—Midseason; standard, large, well-colored; desirable.

Diamond.—Midseason; very productive; partial to localities.

Eureka.—Early; good size and color; not of highest quality.

Gregg.—Late; large; lacks productiveness; high quality.

Kansas.—Early; very productive; fruit large, glossy black, sweet; standard.

Palmer.—Early; productive; medium size; standard.

Plum Farmer.—Early midseason; very productive; highly regarded for commercial planting.

PURPLE RASPBERRIES

Purple raspberries are hybrids between red and black raspberries. They resemble the black raspberry more than the red, and their soil requirements and methods of culture are very similar to those for black raspberries. The plants are very productive. The fruit is not very attractive in color and lacks somewhat in firmness. The berries are too tart to be pleasant for dessert in the fresh state, but when cooked the sauce is very acceptable.

Shaffer and Columbian are the leading varieties, the Columbian being more popular on account of its firmness. The Columbian is largely planted in Erie County, and to a lesser extent in Monroe County. It is in demand at canneries and also to some extent for evaporation. The season of purple raspberries is somewhat later than most of the reds, starting about the middle of July in western New York, and lasting from fifteen to twenty days.

ACREAGE AND YIELD OF RASPBERRIES IN NEW YORK STATE, BY COUNTIES
(Taken from U. S. Census, 1910)

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Albany	227	251,410
Allegany	6	10,940
Broome	48	45,413
Cattaraugus	51	84,462
Cayuga	73	100,363
Chautauqua	517	709,987
Chemung	82	63,824
Chenango	23	24,663
Clinton	5	5,524
Columbia	153	202,083
Cortland	33	31,691
Delaware	14	18,467
Dutchess	21	43,612
Erie	908	1,277,766
Essex	19	14,132
Franklin	19	22,260
Fulton	24	29,373
Genesee	44	60,028
Greene	23	30,211
Hamilton	2	375
Herkimer	13	19,860
Jefferson	31	30,095
Kings		
Lewis	4	5,383
Livingston	108	138,332
Madison	98	110,753
Monroe	602	951,895
Montgomery	38	45,454
Nassau	2	1,458
New York		
Niagara	305	475,729
Oneida	48	67,269
Onondaga	143	318,712
Ontario	1,907	2,560,565
Orange	156	274,352
Orleans	83	105,157
Oswego	316	354,126
Otsego	58	78,269
Putnam	1	795
Queens		
Rensselaer	105	139,650
Richmond	6	4,920
Rockland	17	23,458
St. Lawrence	16	13,478
Saratoga	71	70,088
Schenectady	58	67,561
Schoharie	68	91,256
Schuyler	650	546,695
Seneca	20	32,070
Steuben	179	138,172
Suffolk	13	12,593
Sullivan	6	10,846
Tioga	30	29,038

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Tompkins	36	31,708
Ulster	707	1,214,514
Warren	13	9,853
Washington	17	20,435
Wayne	1,552	2,812,202
Westchester	15	14,033
Wyoming	48	50,065
Yates	1,225	854,517
	<hr/>	<hr/>
The State	11,057	14,751,940
	<hr/> <hr/>	<hr/> <hr/>

THE BLACKBERRY AND DEWBERRY

"Feed him with apricocks and dewberries. . . ."

MIDSUMMER-NIGHT'S DREAM III, 1:169

[1369]

BLACKBERRIES AND DEWBERRIES

O. M. TAYLOR

Foreman in Horticulture, New York State Agricultural Experiment Station,
Geneva, N. Y.

Blackberries and dewberries are surpassed in commercial importance in this state by strawberries, raspberries, and currants, in the order named; yet they have considerable value in certain parts of the state. The 1910 census places the state acreage at 1,951, the yield at 2,509,851 quarts, and their value, \$210,986. The largest plantings are found in the counties of Niagara, Ulster, Monroe, Albany, and Chautauqua in the order named. But few, if any, plantations are found in the colder parts of the state.

This fruit is well adapted for use in local markets and for home use. It is somewhat in disfavor, partly on account of lack of hardiness, but largely because the fruit is mostly picked before fully ripe and before the delicious sprightliness of the flesh is properly developed.

LOCATION AND SOIL

Blackberries are somewhat less hardy than raspberries, and if possible should be given a more sheltered location. If picked when fully ripe, the fruit may not carry well over long distances. Most varieties do well in a deep, moist, but well-drained sandy or clay loam, but an excess of nitrogen may result in immature wood, followed by winter injury. The extreme types of soil should be avoided. Plants are a failure on a wet soil.

The new growth of dewberries should receive some winter protection, and thus may be grown in more exposed localities. Dewberries succeed best, however, on comparatively light, sandy loams.

MANURE AND FERTILIZERS

The blackberry does not vary much from the raspberry in its food requirements, and the suggestions given for red raspberries, page 1355, will apply to this fruit. It is important, however, to avoid overstimulation with nitrogen. For this reason muck soils should be avoided, as they usually contain too much nitrogen.



FIG. 469.—SNYDER BLACKBERRY

The older plantations will bear heavier applications of plant food than those which are younger, but the danger of winter injury resulting from an immature excess of growth must be kept in mind and the plants be fed accordingly.

PROPAGATION

Blackberries may be propagated by suckers as described under red raspberries, page 1355, or by root cuttings. Plants from root cuttings are usually preferred, as they have a larger and more fibrous root system. Roots one-eighth of an inch or more in diameter are cut into about four-inch lengths — usually in the fall — stratified in sand over winter, and sown three or four inches apart in nursery rows in the spring. By this method good plants may be secured in from one to two years. Commercial growers usually increase their plantations by digging up the suckers which develop along the rows.

Dewberries are propagated by tip-layers as described under black raspberries, page 1362.

Blackberry plants may be set either in fall or spring. If set before winter, the rows should be back-furrowed to prevent heaving. The plants should be set fully as deep or slightly deeper than they stood in the nursery. Dewberries should be set in spring as described for black raspberries, page 1362.

CULTURE

The distance between plants is governed partly by method of culture and partly by the richness of soil and the variety. The bushes make a dense, thorny growth which should not be crowded. Blackberries require more room than raspberries — eight feet by three feet if intended for matted rows, or, if kept in hills, the distance may be from eight feet by four feet to seven or eight feet apart each way.

The spacing of dewberry plants depends on the method of training: if grown in hills and staked, about four feet by four feet; if trained on a trellis, about six feet by three feet. After thorough preparation of the soil, the land may be marked both ways and a furrow opened one way, the plants being set at the intersection of the cross mark with the furrow, or they may be set with a spade after the ground has been marked.

Cultivation should be thorough, as described for raspberries, page 1356, and cover crops may be used as desired. Intensive cultivation is especially important, as the fruit matures later than most of the other small fruits at a season when droughts may be expected. Hoed crops may be planted between the rows the first year.

The pruning of blackberries is similar to that described under black raspberries, page 1346, except that the summer pruning is made at a slightly lower height. If the plants are grown in hills and staked, however, the new growth is not pinched back in the summer. Practices differ in regard to cutting back the laterals in the spring, good crops often being secured without any heading-in of the lateral branches.

The vinelike growth of dewberries must be supported by stakes or trellis. The new growth is not pinched back in summer but is allowed to run on the ground along the row, and is thinned out, tied up, and cut back to the desired length the following spring. A convenient trellis is made by stretching two wires, one on each side of the row, fastened to end stakes and supported at intervals by stakes, the wires being tied together at convenient distances by twine. In other cases either one wire or two wires, one above the other, are stretched along the row and the canes tied directly to the wires. Blackberries are grown both with and without trellis, using either stakes or wires as already described.

INSECTS

The canes of blackberries are often injured considerably by the snowy tree-cricket, and to a lesser extent by the raspberry cane-borer. In some seasons the foliage may be infested by the raspberry sawfly and the red spider.

All of these insects are discussed under red raspberries, page 1356, and need no repetition.

DISEASES

Anthracnose and orange rust often cause considerable loss to blackberry growers. The plants are also attacked to a lesser extent by cane blight, yellows, and root-knot. These diseases are described under red or black raspberries, pages 1358, 1359, and 1363. Dewberries are as a rule somewhat less subject to attacks of insects or diseases than are blackberries.



FIG. 470.— McDONALD DEWBERRY.

HANDLING AND MARKETING THE FRUIT

The yield of blackberries may vary from two thousand quarts to three thousand quarts per acre; dewberries yield considerably less than blackberries. Plantations of blackberries usually last from five to ten years, which is longer than black raspberries, although half a dozen good crops are about as much as can be expected. Dewberries are usually slow in developing and generally persist longer than any of the other classes of berries mentioned. Quart boxes are used in picking blackberries and dewberries, and the same care exercised in picking and handling red raspberries apply to these fruits. It must be remembered that the flavor and quality are not at their best until the fruit is too soft to stand rough handling or to be shipped any distance. The season of blackberries is later than most of the bush fruits, beginning the middle or latter part of July. Dewberries mature slightly in advance of blackberries.

VARIETIES

The method of determining what varieties to plant should be similar to that described for raspberries, as the different varieties have unlike values under different conditions. In the cooler parts of the state only the hardiest varieties should be planted. The Snyder is one of the hardiest of all varieties, though not the best, lacking in size and often in attractiveness of color. Agawam, Briton, and Eldorado are hardy or nearly so, and much better than Snyder, both in size and quality. The earliest kinds usually lack in yield. Mersereau and Erie are desirable kinds, the latter being popular in parts of Monroe County. The two best known varieties throughout the state are the Snyder and Eldorado. Blowers, Ward, Rathbun, and Chautauqua are grown to a limited extent.

Among dewberries the Lucretia easily heads the list wherever this fruit is grown. The other kinds named are worthy of trial.

Blackberries

Agawam.—Medium early; long season; hardy, very productive.

Briton (*Ancient Briton*).—Season medium; very productive, mild, high quality, medium size.

Eldorado.— Medium early; hardy; large fruit; desirable.

Erie.— Midseason; vigorous, fairly hardy; berries attractive color.

Kittatinny.— Late midseason; vigorous but not very hardy, berries large, attractive black.

Mersereau.— Late; not always hardy; large; desirable.

New Rochelle.— Late; old variety; usually hardy; vigorous.

Snyder.— Midseason; usually hardy; berries small.

Dewberries

Lucretia.— Early; berries attractive, black, large, long; the most popular variety.

Premo, *Mayes*, and *McDonald* should be tested in a small way.

THE CURRANT

*" . . . currants, hanging from their leafless stems,
In scanty strings, had tempted to o'erleap
The broken wall."*

WORDSWORTH'S EXCURSION

[1379]

CURRENTS

O. M. TAYLOR

Foreman in Horticulture, New York State Agricultural Experiment Station,
Geneva, N. Y.

New York State ranks first of all the United States in the production of currants. The census report of 1910 indicates the plantings at 2,557 acres, yielding 3,982,389 quarts, valued at \$264,051. Currants rank third in importance in the state, being surpassed by strawberries and raspberries. By far the largest plantings are in Niagara County, followed in order named by Ulster, Monroe, Albany, and Chautauqua. The hardy nature of the plant is shown from the fact that the reports indicate its being grown to a greater or less extent in fifty-eight counties, as it is able to withstand winter injury in the colder portions of the state. At present, however, its culture is slightly on the decline, owing largely to the unfavorable condition of the markets during the past few years.

LOCATION AND SOIL

Currants are by nature northern plants. They do not thrive in the heat of the South and are there of no commercial importance. They are found growing successfully only in cooler climates, and are uninjured in low temperatures which are fatal to many other plants. They thrive best in the north temperate regions, in northern exposures, on cool, moist, retentive soils — not, however, wet and cold — and under some conditions in the partial shade of orchard trees or vineyards. While some fruit may be obtained on almost any soil, the heavier, well-drained clay loams should be selected for commercial purposes, avoiding as far as possible those of a light, sandy nature.

MANURE AND FERTILIZERS

There is but little danger of too much plant food in the soil. Currants are rank feeders, and to secure maximum yields a rich soil and liberal applications of available food are essential. The

roots extend but a short distance and their food must be within reach. Stable manure is one of the best fertilizers and should be applied preferably in November or during the winter or in early spring.

The kind and amount of commercial fertilizer to use depend on conditions. The food requirements of the currant are not materially different from those of other fruits, and the supplements needed on any soil are best determined by individual experiments with nitrogen, phosphoric acid, and potash, leaving checks so that benefits, if any, may be apparent. The following amounts are suggestive: two to three hundred pounds per acre of nitrate of soda or three to six hundred pounds dried blood applied as soon as the leaves have unfolded; one ton of wood ashes or two to three hundred pounds muriate of potash; six to seven hundred pounds acid phosphate — all to be applied early in the spring. The fertilizers will not take the place of humus.

PROPAGATION

Currants are easily propagated. In the fall, as soon as the leaves have dropped, usually in late September or early October, hardwood cuttings from six to ten inches long — the longer cuttings being preferred for dry soils — are made from well-ripened wood of one season's growth. They may be planted at once in the nursery row or tied in bundles and buried butt end up in moist sand or moss to callous for a few weeks, after which they are planted; or they may remain in the sand until early spring. The cuttings are planted deeply, leaving but one or two buds above the surface and placing them from four to six inches apart in the row. If fall-planted, they must receive winter protection, either with a slight backfurrow of earth or with a covering of coarse stable manure or straw applied after the ground freezes.

The cuttings are left in nursery rows from one to two years. A few plants are occasionally propagated from layers, the canes being bent down and a portion covered with earth, leaving the tips exposed. Roots soon develop from the covered cane, which may then be separated from the main bush and planted in a permanent location.

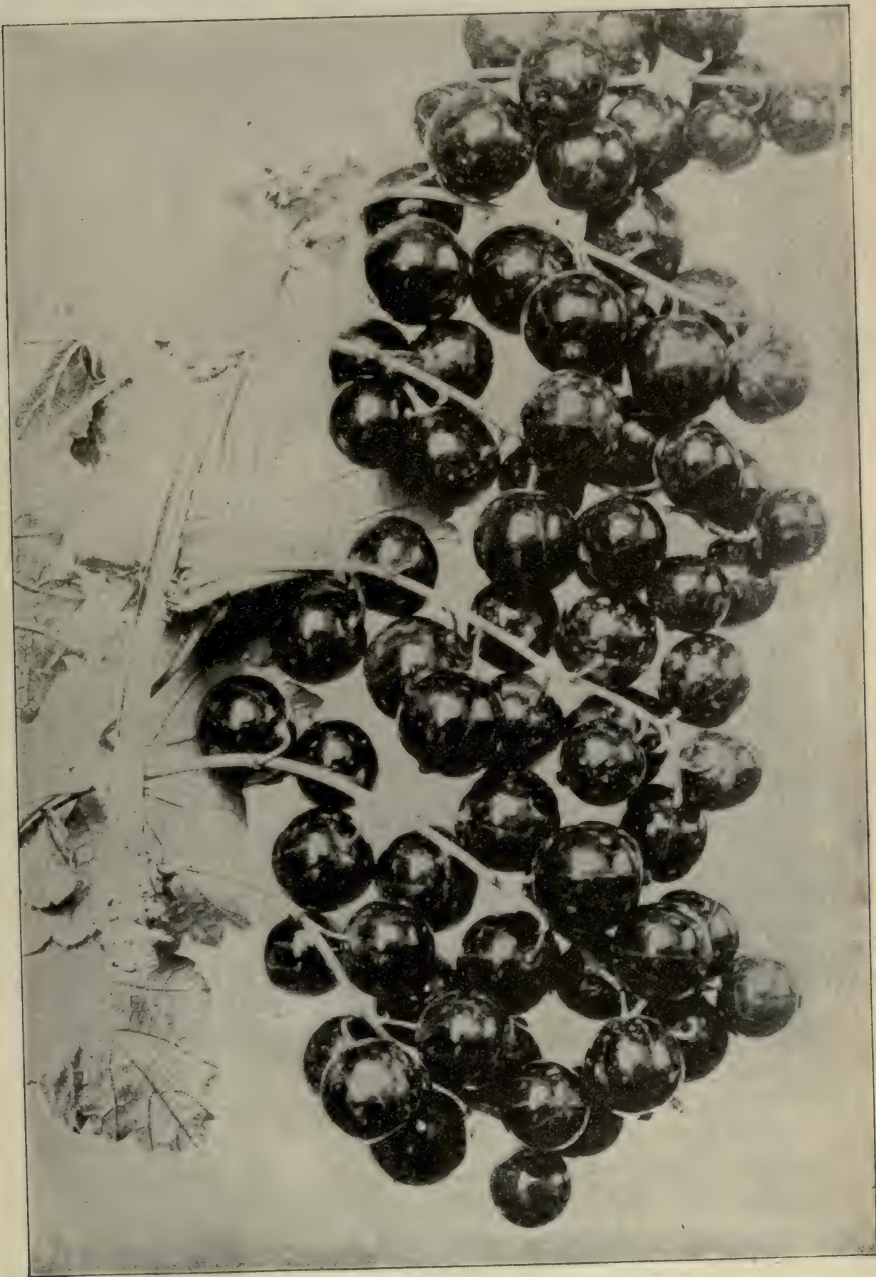


FIG. 471.—RED CROSS CURRANT

CULTURE

Strong one-year or two-year-old plants may be set either in fall or spring. The buds start growth early, and for this reason fall planting is preferable. The distance between rows and plants depends upon the richness of the soil and the habit of growth of the variety. The usual distance for most varieties is six by four or five feet, the wider distance being preferable. Six by six feet is none too far for some varieties. Black currants should be given more room than reds, on account of their vigor. After marking the ground both ways the plants may be set rapidly by plowing a deep furrow one way and setting the plants at the intersection of furrow and mark, placing them slightly deeper than they stood in the nursery row.



FIG. 472.—CURRANTS ON FARM OF WILLIAM HOTALING, KINDERHOOK, N. Y.

As the root system is shallow, cultivation should not be deep near the plants. For family use, currants succeed fairly well mulched with coal ashes, straw, or coarse stable manure. Thorough and frequent cultivation is preferable. After the crop has been harvested, the soil should be put in condition for a cover crop to be sown in late July or early August, using about fifteen pounds

clover seed per acre or twenty-five pounds vetch, or about one bushel of oats or barley. Mixtures of the seed are sometimes used to advantage. A hoed crop may be grown between the plants the first year.

Systematic pruning is essential. The best fruit is borne at the base of one-year-old shoots and on one-year-old spurs which develop from the two- and three-year-old wood. Most of the wood over three years old should be cut out and only enough of the yearling wood left to maintain a yearly supply of the younger wood. From five to eight canes are usually sufficient per bush. Most bushes are left too thick. An upright, yet open, habit should be encouraged. It is usually unnecessary to head back the new canes except those making a long, irregular growth, but it is often an advantage to cut back very vigorous shoots. Pruning may be done any time after the leaves have dropped up to the time growth starts in the spring. The fruit of black currants is borne on wood of the previous year. At time of setting, the tops and roots are usually shortened back from one-third to one-half, depending on the amount of growth.

SPRAYING

Disease or insect pests are to be expected each year. Fortunately, both may often be treated at one application by using the proper materials. The bushes should be sprayed with a combined insecticide and fungicide soon after the fruit begins to swell, and again with a fungicide after the fruit has been harvested.

INSECTS

Currant Worm

The foliage is attacked by the worms, of which two broods a year hatch from eggs laid on the under side of the leaves. The worms are easily killed with an arsenical spray such as arsenate of lead, three pounds to fifty gallons, applied as soon as they make their appearance, usually when the fruit is half grown. This spray should be combined with a fungicide — either bordeaux mixture, 3-3-50 formula, or lime-sulphur 1 to 40. Powdered hellebore is sometimes used — a teaspoonful to a gallon of water.

Currant Borer

This insect eats a burrow along the center of the cane and remains in this tunnel over winter. The infested canes should be cut out and burned during the winter or early spring.

San José Scale

This is too well known to require description. It should receive the same dormant treatment as other fruits — lime-sulphur, 1 to 8, or one of the oil sprays.

Currant Plant Louse

Many small lice may be found on the under surface of the leaves in midsummer, causing them to appear blistered and reddish on the upper surface. They are sucking insects. Whale-oil soap, 1 pound to 5 gallons of water, or kerosene emulsion applied to the under side of the foliage will kill all that are hit with the mixture.

DISEASES

Leaf-Spot

Leaf spot is a fungous disease causing a brown spotting of the foliage, the leaves often dropping prematurely. Remedy: Lime-sulphur, 1 to 40, or bordeaux mixture, 3-3-50, applied at time of spraying for worms and again after harvest.

Cane-Blight

Cane-blight is a fungous disease that is quite destructive in the Hudson Valley. One or more canes die during the summer, or the death of the entire bush follows. There is no satisfactory remedy.

HANDLING AND MARKETING THE FRUIT

Under ordinary conditions, currants cannot be expected to produce profitable crops for more than eight or ten years, although some fields may be held for a longer period. Old bushes may sometimes be rejuvenated by cutting off all the canes close to the ground and giving a liberal application of stable manure.

The fruit must be picked and handled with care to arrive at its destination in good condition. The berries should be dry when

harvested and not overripe. The stems should be severed from the bushes without injury to the berries. Some varieties are more easily picked than others, on account of the clear space of stems at the base of the clusters. Fruit is picked greener for distant markets than for nearby markets and greener for jelly than for canning, a few green berries showing on each cluster. Currants are usually marketed in quart baskets or in grape baskets and are sold mostly by the pound.

Yields of currants vary from fifty to two hundred and fifty bushels per acre with an average of from one hundred to one hundred and fifty bushels annually. Some fruit will be secured the third year, but a full crop will not be produced until the fourth year. Black currants usually yield slightly less than reds.

Mr. Samuel Fraser, Geneseo, N. Y., reports that the cost of growing and selling a three-ton crop of currants is nearly \$200 per acre. The price received usually varies from four to eight cents per pound, averaging about five cents. In recent years the tendency of market prices has been downward. Most of the fruit goes to canning and jelly factories, and is used largely for making jelly, jam, and pies.

VARIETIES

A variety may succeed in one place and yet be undesirable in another locality. Adaptation should be determined as with all fruits before planting extensively. But few of over thirty varieties on the grounds of the Experiment Station, Geneva, N. Y., have any commercial value.

The commercial culture of currants in this state is practically confined to red currants, largely on account of their fine jelly-making properties. The whites make a jelly unattractive in appearance, and the berries are not very good shippers. The peculiar flavor of the black currant is objectionable to many people, and the market demand is limited.

Currants begin ripening at Geneva the last week in June, and the varieties succeed each other during a period of three weeks. There are no very early or very late popular commercial varieties, most kinds maturing in midseason. With some varieties the fruit hangs on the bushes for a week or more after maturity without much deterioration. Preference is given to those varieties having

a berry of at least fairly good size up to those of largest size. Cherry, Fay, and Red Cross are among the most popular of the medium early and midseason varieties, and Wilder follows closely as a later midseason variety. Perfection is grown commercially, the fruit being most attractive in appearance, though the bushes might well be taller. Filler is grown considerably in the Hudson valley. Of all varieties the Wilder is doubtless found planted throughout the state more extensively than any other variety.

Red Currants

Cherry.— Large; clusters short; productive; standard.

Fay.— Sprawling habit; large; medium productive.

Filler.— Productive; bunches short; berries large.

Perfection.— Bush more upright than Fay, medium in vigor; large berries, high quality.

Red Cross.— Large; milder and slightly later than Cherry.

Red Dutch.— Growth good; sprightly acid; dark red; medium size.

Wilder.— Good late variety; vigorous; fruit large; long season; standard.

White Currants

White Imperial.— Mild, high quality for dessert; pleasant flavor.

White Grape.— Large; attractive color; medium quality.

Black Currants

Champion.— Mild, nearly sweet.

Prince of Wales.— Very productive, mild, sweet; vigorous.

Boskoop Giant.— Very promising; large berries, long clusters; productive; one of the best.

THE GOOSEBERRY

"The gooseberry trees that shot in long lank slips."

WORDSWORTH'S EXCURSION

[1389]

GOOSEBERRIES

O. M. TAYLOR

Foreman in Horticulture, New York Agricultural Experiment Station,
Geneva, N. Y.

The gooseberry is not grown extensively anywhere in the United States. New York State ranks fifth in the commercial importance of the fruit, and when compared with the other small fruits the gooseberry stands at the foot of the list with an area according to the last census of 259 acres, producing 331,135 quarts valued at \$23,427. This neglect is partly due to the fact that in this country the most of the fruit is used while green, before its flavor has developed. In England, where the climate is somewhat more congenial for the maturing of the fruit, it is a popular class of fruit for dessert purposes. Were people in this country generally more familiar with the delightful flavor and high quality of the matured fruit of some of the European and hybrid varieties, which can be grown in many places, an additional outlet for the fruit would soon be developed.

Ulster is the leading gooseberry county in New York State, followed by Orange. About equal areas are given to this fruit in the counties of Chautauqua, Monroe, and Niagara, with slightly smaller plantings in Columbia. It is, however, found in small beds in nearly all the counties of the state.

LOCATION AND SOIL

Gooseberries are among the hardiest of the small fruits, being found growing wild in some forms nearly to the Arctic Circle. They closely resemble currants in many of their requirements, and like them prefer a cool soil of rather heavy, clay-loamy type. Sandy soils which become hot and which dry out quickly should be avoided. Partial shade from orchard trees or vineyards gives some relief from sun and wind. Coolness and moisture are important essentials, especially with the English varieties.



FIG. 473.— DOWNING GOOSEBERRY

MANURE AND FERTILIZERS

The soil should contain an abundance of available plant food, and there is but little danger of its being too rich. Annual applications of stable manure applied during the dormant season or in early spring are beneficial, and applications of commercial fertilizers may be made as described under currants, page 1382. Gooseberries are gross feeders, and the materials used by them should be within reach of the comparatively small and shallow root system.

PROPAGATION

American varieties of gooseberries may be propagated with fairly good results by using cuttings as described under currants, page 1382. The European kinds, however, do not root readily, and for these mound-layering is resorted to, which method is also followed to some extent for the American varieties. The tops of the bushes are cut back severely during the dormant period. This results in the development of many young shoots the following season. About the middle of July the earth is drawn up around and among these shoots, leaving only the upper portions exposed.

Shoots of most of the American varieties will have developed a good root system by fall, but most European varieties require two years to become well rooted. The rooted shoots are cut away from the old plants and are set in nursery rows for one or two years, depending on their vigor.

CULTURE

Fall-setting is usually preferred for gooseberry plants, although they may be planted with good results in the spring if the work is done early. They should be set about six feet by four feet for the small-growing varieties, while six feet by six feet will not be too wide for those of vigorous habit. The method of setting the plants is similar to that described under currant, page 1384, as is also the subsequent treatment of cultivation and cover crops. The plants must have thorough cultivation, and shallow, but frequent, as the gooseberry is subject to greater injury from drouth than is the currant.

Plants may be pruned any time during the dormant period. The bush form is usually preferable to the tree form. Five or six shoots, well distributed, usually make a well-shaped top. Fruit



FIG. 474.—INDUSTRY GOOSEBERRY

is developed on one-year-old wood and from spurs on the older branches. The oldest wood should gradually be removed to give place to the younger, more vigorous shoots. Young shoots are headed back as desired; the center should be open, yet not too much exposed to the sun's rays, or injury from scald may result, while branches tending to touch the ground should be removed to give a better circulation of air.

SPRAYING

To secure best results, gooseberries should be sprayed annually. The foliage is subject to attacks of the currant worm and to leaf-spot. These are fully discussed under currants, pages 1385 and 1386. It is especially important with gooseberries that the foliage be preserved, as the fruit should be well protected by the leaves to prevent sunscald.

MILDEW

This disease may attack leaves, twigs, or fruit of the European varieties. Patches and spots of moldy, weblike covering appear, which at first are light gray but which turn a brownish color. The bushes become stunted, and the fruit is worthless for market when infested. This disease usually yields to repeated applications of potassium sulphide (liver of sulphur), one ounce to two gallons water applied as the leaves begin to open and repeated every ten days or two weeks. Lime-sulphur is a promising remedy and worthy of test. The mildew has not been so serious in recent years as in the past.

HANDLING AND MARKETING THE FRUIT

Harvests may be expected for a number of years, much depending on the thoroughness of the renewing process of pruning. Some plantations have given good crops for over twenty years, but most beds are discarded after ten or twelve good crops have been secured. They will bear some fruit the second year from planting, and a full crop may be expected the fourth year. Most of the gooseberries of this state are picked green and disposed of at canning factories. The market demand is limited. The berries are usually stripped from the bushes — a difficult operation with the thornier varieties — and run through a fanning mill to remove the leaves. For the markets the fruit is packed in quart boxes or grape baskets. The custom of handling it green prevents the mature flavor

and quality from becoming known, although some of the European varieties in particular, when properly ripened, are unusually fine for dessert in the fresh state.

Yields vary widely, but mature plants set 6x4 may yield from two hundred to four hundred bushels per acre. The American varieties are usually considered more productive than the Europeans, but this is not always the case. Prices range from four to ten cents per pound, depending on variety and market conditions, the average being about four or five cents. Prices in recent years are on the decline.

VARIETIES

Varieties of American gooseberries are grown much more extensively in this state than are the European kinds. The leading varieties are Downing, Pearl, and Josselyn. There are also a number of hybrids well worthy of attention. The widest variations in size and color exist among the classes. Downing is the most popular, as well as the most widely-planted variety of the Americans, and Industry leads among the Europeans. Chautauqua is becoming more widely planted. The American varieties average smaller than the Europeans. Houghton and Josselyn, red varieties, are too small in berry. Pearl is very similar to Downing. Plants of European varieties as compared with Americans are stockier, with shorter, thicker, more upright branches, and with thicker, glossier foliage, the fruit usually being much larger.

American Gooseberries

Downing.— Standard ; pale green ; excellent flavor and quality ; one of the best.

Josselyn.— Pale red ; very vigorous ; productive. Berries small.

Pearl.— Resembles Downing.

Poorman.— Large bushes ; productive. Berries medium size, pinkish-red. A variety of promise, worthy of test.

European Gooseberries

Chautauqua.— Pale green ; excellent flavor and quality.

Industry.— Very productive ; dark red ; high quality ; one of the best.

Whitesmith.— Vigorous ; pale yellowish green ; sweet ; very good.

TOTAL ACREAGE AND YIELD OF SMALL FRUITS IN NEW YORK STATE BY COUNTIES

(Taken from U. S. Census, 1910)

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Albany	588	821,241
Allegany	31	72,359
Broome	146	298,871
Cattaraugus	137	255,918
Cayuga	173	243,117
Chautauqua	993	1,644,853
Chemung	142	199,321
Chenango	56	78,380
Clinton	21	30,947
Columbia	620	1,274,978
Cortland	69	81,873
Delaware	43	71,250
Dutchess	214	591,877
Erie	1,603	3,070,452
Essex	42	44,083
Franklin	79	66,283
Fulton	76	179,470
Genesee	95	130,784
Greene	85	131,739
Hamilton	3	2,072
Herkimer	206	539,848
Jefferson	122	157,002
Kings	1	558
Lewis	34	58,373
Livingston	204	326,104
Madison	212	302,446
Monroe	1,283	2,540,005
Montgomery	89	117,489
Nassau	149	268,726
New York	9	51,100
Niagara	752	1,179,339
Oneida	193	382,329
Onondaga	359	862,253
Ontario	2,182	2,903,359
Orange	1,192	1,727,892
Orleans	236	300,311
Oswego	764	1,477,157
Otsego	132	184,098
Putnam	8	14,323
Rockland	108	165,827
Rensselaer	348	715,791
Richmond	90	151,354
Queens	5	21,164
St. Lawrence	70	79,034
Saratoga	223	371,609
Schenectady	156	212,752
Schoharie	92	119,041
Schuyler	701	619,209
Seneca	71	112,510
Steuben	271	317,574
Suffolk	385	563,395
Sullivan	22	38,554
Tioga	75	127,480

<i>County</i>	<i>Acres</i>	<i>Quarts</i>
Tompkins	101	154,434
Ulster	2,797	6,371,934
Warren	62	87,185
Washington	75	134,382
Wayne	2,011	3,558,505
Westchester	95	154,497
Wyoming	98	121,538
Yates	1,297	966,480
<hr/>		<hr/>
The State	22,496	37,857,829
<hr/>		<hr/>

FRUITS IN THE HOME

*"So down we sit, though not till each had cast
Pleased looks around the delicate repast —
Rich cream, and snow-white eggs fresh from the nest,
With amber honey from the mountain's breast;
Strawberries from lane or woodland, offering wild
Of children's industry, in hillocks piled;
Cakes for the nonce, and butter fit to lie
Upon a lordly dish; frank hospitality
Where simple art with bounteous nature vied,
And cottage comfort shunned not seemly pride."*

WORDSWORTH'S EPISTLE

THE DIETETIC VALUE OF FRUIT

IDA S. HARRINGTON

Farmers' Institute Lecturer, Albany, N. Y.

"Fruits that shall swell in sunny June,
And redden in the August noon,
And drop, when gentle airs come by,
That fan the blue September sky."

— BRYANT



A well-known teacher of dietetics has said, "Nothing gives me so great a sense of health and well-being as to have a supply of fresh fruit within reach!"

If more of us retained that same inborn taste for simple foods and natural flavors, the health of the country would be better than it is today. Not that we scorn fruit wholly, but, after childhood is left behind, we grow to class it as an extra, a side dish, something that—as one woman expressed it—"is nice to eat when you have had all you want of other things."

Few housewives would consider that they had shown a proper pride in their table if they set before their families as a dessert merely a dish of rosy apples. Something impels us to "gild the lily" and to make that dish of apples over into a pie or a Brown Betty pudding before offering it as a regular course in the meal.

A student who had been attending a summer cooking school remarked on her return, "Every student there seemed possessed to learn the making of fancy desserts; I got so that I just longed for a plain dish of berries!" It is human nature to think slightly of overfamiliar things. Not unless we are deprived of them do we value our "plain dish of berries" as we should.

With a growing sense of the importance of a balanced ration for human beings, we shall learn that we cannot belittle the dietetic value of fruit without paying an inevitable penalty. No matter if it would take seventy-five pounds of strawberries to give

us enough protein for our needed daily supply! That is not what we eat them for. It is not the function of fruit to build tissue or yield energy, but to help the body make the best use of the foods which exercise this function. Fruits have a dietetic value rather than a food value; in other words, they are wholesome rather than nutritious. Their attractive appearance and pleasant flavor is in itself a benefit, but they meet more important needs than these. The body requires mineral matter, and fruits furnish it in abundance; it requires acids, and fruits yield them in wholesome form; it requires enough bulky, indigestible food to stimulate the organs of elimination, and fruits are valuable in supplying this need. Dr. Langworthy has well said, "Intelligently used, fruits are a valuable part of a well-balanced diet, and may well be eaten in larger quantities than at present."

INTELLIGENT USE OF FRUIT

An intelligent use of any food means that its use must be adapted to suit the requirements of those who are fed. Feeding fruit indiscriminately to people of all ages and conditions would be as senseless as insisting on the cold plunge bath for everybody at all seasons, regardless of results. Aside from individual peculiarities (as in the case of persons who are poisoned by strawberries) which forbid the use of certain fruits, there are general rules that cannot safely be overlooked. The woody material known as cellulose, which acts as a wholesome intestinal stimulant under normal conditions, becomes irritating if the intestine is oversensitive, or if mastication is faulty.

Both conditions must be considered in giving fruit to young children. Until a child is four years old, it is best restricted to such fruits as baked apples (carefully skinned and cored), apple sauce, or prune pulp. It should also be given jellies rather than jam or marmalades, since in the last two there is abundant chance for mischief from skins and seeds.

ACID FRUITS

Sensitive digestions may be affected by using an acid fruit at the same meal with cereals and milk. Again we have an example in young children. While orange juice may safely be given even before the child is one year old, it should always be midway between the regular feedings of milk.

MASTICATION OF FRUITS

Digestive troubles are often ascribed to the eating of fruits, when the trouble is wholly due to the swallowing of unchewed particles. Even the green apple would be less deadly than it is commonly believed to be, were it not for the haste with which it is bolted by secret feasters.

UNRIPE AND OVERRIPE FRUIT

In spite of what has just been said, it is sometimes a dangerous experiment to eat unripe fruit raw, and it is moreover an unnecessary one, since such fruit is made both wholesome and palatable by cooking. Among the unripe fruits that require cooking, few people include the banana. Yet it is true that we in the North often get them green, before the starch in them has even begun to be changed to the more digestible sugar. In this condition they are suitable for cooking, but not for serving raw.

Fruit that is overripe, which means that it has begun to ferment, is not a safe food, and there is no economy in eating it "to save it." The saving should have come at an earlier stage. Herein lies the importance of canning the surplus supply.

SERVING FRUIT CLEAN

If fruit is to be eaten raw, it is especially important that it be clean. This may seem a superfluous caution in the country, where we are safe from the infected dust of city markets. Nevertheless, it is not wise to disregard wholly the much-quoted theory of Metchnikoff that harmful parasites or their eggs may be carried to the intestines from raw fruits that have come in contact with the soil. Apples picked from one's own orchard, or grapes from one's own vines, may be considered safe without sacrificing their bloom by washing; but the strawberry, notwithstanding the fact that it grew in the home bed, may easily be tainted with fertilized soil and needs careful washing, even when it looks clean. Berries of all kinds are most conveniently washed, after they have been looked over, by putting them into a colander and letting water run over them; or, failing running water in the kitchen, by lowering the colander full of berries into a bowl of cold water, and raising it up a number of times so that the water flows freely over the fruit. It will be necessary to renew the water several times.

Berries should be washed as short a time as possible before serving and should be well drained. Peaches are best cleaned by wiping with a soft, dry cloth.

A dish of fruit fresh from orchard, garden, or vine makes a centerpiece for the table that not only delights the eye and pleases the palate, but contributes materially to the wholesomeness of the meal.

COOKING OF FRUITS

While cooked fruits lack something of the perfection of fruits in their natural state, they fill an important place in planning the dietary. As has already been suggested, green fruit may be utilized for cooking, with excellent results. Imperfect fruit, unfit to serve raw, may still yield large portions that are suitable for cooking. We may be planning meals for someone with whom raw fruit disagrees, while cooked fruit is beneficial. We are able by cooking to make use of such fruits as quinces, cranberries, etc., which cannot be served in any other way; or it may be desirable, if the rest of the meal has been a light one, to provide a dessert that shall be more nourishing than fruit alone would be. This is the proper function of the many combinations of fruit and pastry, fruit and custard, and fruit and batter, which are known as pies and puddings.

DISHES MADE FROM APPLES

In a state that grows apples as generously as our own, housewives have a great advantage in planning their dietaries, for no other one fruit is so generally popular or so widely useful as the apple. It is one of the few fruits that are equally good cooked or raw. Baked apples are welcomed as a breakfast or supper dish; apple sauce is as acceptable with roast pork as with gingerbread; apple water makes a refreshing drink for the invalid's tray. Apples lend the jelly-making element to many a jelly that parades under the name of another fruit. The number of recipes in which apples are included mounts up into the hundreds. It is true that this is in part due to the fact that, owing to their keeping qualities, apples have reigned almost alone as a winter fruit. Now that successful methods of home canning make it possible to keep all kinds of fruit for winter use, it is well to remember that in many of the apple recipes other fruits may be substituted with good results, as will be shown.

Baked Apples

Remove the cores from apples of uniform size. Put into a baking dish, filling the hollows with sugar, and add one-fourth cup of water. Baste with sugar and water as needed. The oven should be moderate, so that the apples will not cook to pieces. When done, cool and serve with or without sugar and cream.

For variety, baked pears may be substituted. They are baked whole, and are best when cooked in a bean pot, closely covered, in a slow oven, and sweetened with molasses or brown sugar.

Apple Sauce

This may be cooked in the oven or on top of the stove. Wash, pare, and core sour apples. For paring, use a very bright knife if a silver fruit knife is not at hand. Cut the apples in pieces and put them in a saucepan with just enough water to keep them from burning. Cook till very soft, stirring with a wooden spoon and mashing the lumps. Add sugar to taste. If the apples lack flavor, add cinnamon or ginger (stirred into the sugar), lemon juice, or lemon rind, and a small piece of butter. A few quinces make a pleasant variety in flavor.

When apples are very hard, it is not possible to use them raw as pie filling and expect the best results. Pastry needs a quick oven to be at its best, and the apples will be found underdone. The following recipe will be found useful for cases of this kind:

Cooked Apple Filling for Pies

4 cups of chopped apple (previously cored and pared)
2 level tablespoons cornstarch stirred till smooth in $\frac{3}{4}$ cup cold water

Grated rind of half a lemon

$\frac{1}{2}$ cup of sugar

$\frac{1}{8}$ teaspoon cinnamon

A few grains of salt

Let all cook gently for thirty minutes. Strain and cool. This will seem thin at first, but will thicken as it cools.

Raw Apple Filling for Pies

M. W. Howard

3 cups pared and sliced apples

 $\frac{1}{2}$ cup sugar $\frac{1}{8}$ teaspoon salt $\frac{1}{4}$ teaspoon cinnamon

1 tablespoon butter

Grated rind of half lemon.

If peaches are substituted, omit the lemon and cinnamon and add 2 tablespoons of water.

Apple Cake

(Peaches may be used instead)

1 pint flour

 $\frac{1}{2}$ teaspoon salt

4 level teaspoons baking powder

 $\frac{1}{4}$ cup butter

1 egg

 $\frac{7}{8}$ cup milk

4 apples (or more as needed)

2 tablespoons sugar

Mix and sift the dry ingredients. Rub in the butter, as for biscuits or pastry. Beat the egg, add the milk to it, and add to the dry ingredients. Pour into a pan so that the mixture is $\frac{1}{2}$ inch thick. Pare and core the apples and cut into eighths. Arrange the pieces of apple, narrow edge down, in close rows on top of the cake. Sprinkle with sugar and bake in a hot oven twenty to thirty minutes. If the apples do not seem quite tender when the cake is done, invert a tin over the cake after taking it from the oven and leave for five or ten minutes. This will soften the apples by steaming.

FRUIT AND NUT PUDDING

M. W. Howard

(Use peaches, apples, pears, pineapples, or quinces)

1 cup sugar

2 cups fine breadcrumbs

 $\frac{1}{2}$ cup chopped nuts

- 3 eggs
- 2 tablespoons lemon juice
- 1 cup sugar
- 2 cups fruit
- $\frac{1}{4}$ teaspoonful salt

Mix all the ingredients, beat well, pour into a buttered dish and steam two hours. Serve with cream.

FRUIT-AND-CORNSTARCH PUDDING

Add stewed apples, pears, peaches, berries, quinces, or pineapple to a cornstarch pudding just before it is poured into the mold. Strained fruit-juice may be used in place of milk in making the pudding, and milk or cream served with it as a sauce.

QUINCE CUSTARD

Pare, core, and chop the quinces, add a few drops of lemon juice to bring out the flavor. Put into a buttered pudding dish, and cover with a well-sweetened custard in which the yolks and whites of the eggs have been beaten separately. Set the dish inside a pan containing a little water, and bake in a moderate oven till the custard is set.

FRUIT SHORTCAKES

There is no question that the strawberry holds first place as filling for shortcake, and it is equally certain that the shortcake is the favorite method of serving such strawberries as are not to be used in their natural state.

Shortcakes may also be made of peaches, raspberries, black berries, or pineapples.

Strawberry Shortcake.—Sift a pint of flour with 4 level teaspoons of baking powder and one of salt. With the finger-tips rub in 4 level tablespoons of shortening. Add $\frac{3}{4}$ cup of sweet milk, stirring it in with a knife. Roll out of the bowl onto a floured board, and with the knife pat it lightly into shape. Roll out and cut two rounds to fit a layer-cake tin. Place one round in the greased tin, spread the top with melted butter, and place the second round over it. Bake twenty to thirty minutes. The two rounds will come apart easily because of the butter spread between them.

Cover while hot with strawberries that have been hulled, washed, drained, and sweetened. They should stand on the very back of the stove while the cake is baking, so that the heat may help to draw out the juice. Slightly crush the berries with a wooden potato masher after putting the sugar on, but reserve some whole ones for the top of the cake.

FRUIT MUFFINS

Berries may be added to any muffin mixture, using 1 cup of berries to every two cups of flour. The berries are added last.

SUMMER ABUNDANCE FOR WINTER NEEDS

A popular magazine is publishing a series of article entitled, "Youth Leads the Way." A recent number in this series gave a description of the "Canning Girls," working in clubs all over the country, and of the methods and successes.* In developing the possibilities of this great canning movement, youth is indeed leading the way, not only to greater efficiency and economy in conserving our resources, but to more efficient living. When fruits and vegetables become a matter of course in the winter dietary, there will be less "sick leave."

While housewives have always prided themselves on having well-stocked preserve cupboards, we must guard against making the filling of those cupboards an end in itself. The family must not be denied a free use of fresh fruit in its season in order that there may be the more to "do up." Canning is important in order to save the surplus, but it is more important in insuring a balanced diet for the family the year round. If it were only the filled cans we care about, it would not matter so seriously what methods we employ. We might even permit ourselves the use of commercial canning powders to hide the effects of careless work; or we might buy "bargain" canned goods at great apparent saving of money and time. But since it is for the building up of better health for our households that we are working, the commercial canning powders and the bargain sales and the careless methods must all go.

* See article on "Canning Suggestions and Canning Clubs," in Bulletin 62, Part II, published by State Department of Agriculture, Albany, N. Y.

So much has been published about home preservation of fruits that it seems out of place to do more than briefly review the different processes in use, and the advantages and disadvantages of each. Whatever process is used, there is no "trade secret" about successful canning. It is a mere matter of making things clean — not ordinary everyday clean, but surgically or biologically clean. It depends on selecting sound fruit or removing every unsound spot; it depends on the complete destruction by heat of micro-organisms and their seeds (spores) on and in fruit and jars; and it depends on complete protection against the entrance of microscopic destroyers from outside the jar, after all has been made safe within it.

For home purposes, glass jars are in every way to be preferred to tin cans. They cost more to start with, but may be used over and over again with only the addition of new rubbers.

THE COLD PACK METHOD

What is known as the cold pack method of canning is being more and more widely used. By this method jars are filled with uncooked fruit, and jars and fruit are sterilized in one operation. The successive steps of the method are as follows:

1. *Selection* of sound, slightly underripe fruit.
2. *Blanching* by lowering the fruit, which has been placed in a wire basket or cheesecloth, into boiling water and allowing it to boil for five minutes. This loosens the skin, removes objectionable acids, starts the flow of coloring matter, and reduces bulk.
 - 2-b. *Scalding* — that is, pouring boiling water over the fruit and leaving it just long enough to loosen the skin — may be substituted when blanching is not necessary.
3. *Plunging in cold water* to make the fruit easier to handle, to separate the skin, to set the color, and to make the pulp firmer.
4. *Removing the skins*.
5. *Placing the fruit* in a solution of salt and water (1 tablespoon to a quart of water) to prevent discoloration while jars are being prepared.
6. *Preparing jars* by examining them for defects. Test them for leakage, wash, rinse, and turn upside down to drain without wiping.

7. *Packing jars.* Use wooden paddle for packing fruit solidly without crushing it.

8. *Preparing glass tops* by examining them for defects. Rinse in cold water; do not wipe.

9. *Testing rubbers* (new) by stretching. See that they fit snugly. Dip in cold water, adjust on jar, place the glass top, and fasten upper clamp only.

10. *Letting cold water run over the fruit* in the jar from a faucet or pitcher. Invert a small strainer over the top of the jar while rinsing and draining, to keep the fruit from being floated out.

11. *Draining* off the rinsing water by inverting the jar. The strainer should be held in place while doing this.

12. *Filling* with cold water or cold syrup to within $\frac{1}{4}$ inch of the top of the jar.

13. *Wiping the rim.*

14. *Sterilizing* by placing the jars of fruit in a wash boiler or pail on a false bottom made of strips of wood or heavy wire netting. The jars must not touch each other nor the boiler. If pints and quarts are to be sterilized at the same time, make a standard from blocks of wood, with wire netting laid across them, in order to raise the pint jars to the same level as the quarts. Pour cold or lukewarm water into the boiler until it reaches the necks of the jars. Place a cheesecloth, weighted at the four corners, over the boiler, and put on the cover. Count the time of sterilization from the time the water boils. It should boil hard.

TIME-TABLE — HOT WATER CANNERS — COLD PACKED

	Minutes to cook	Size of cans
Apple cider	20	Special
Apples	15	3
Apricots	15	3
Asparagus, greens	60	2 or 3
Beans — lima and string	90	2 or 3
Beets	20	3
Blackberries, dewberries	8	2 or 3
Cherries, peaches	15	2

	Minutes to cook/	Size of cans
Chicken, beef	250	3
Corn without acids	240	2
Figs	30	3
Fish, pork	200	2
Grape juice	15	2
Grapes, pears, plums	15	2
Hominy	60	3
Huckleberries	10	2
Okra	60	2 or 3
Okra and tomatoes combined	50	2 or 3
Oysters	50	1
Peas — field	40	2
Peas — garden or English	60	2
Pineapple	30	2 or 3
Pumpkin	50	3
Quince	30	3
Raspberries	15	2 or 3
Rhubarb	25	3
Sauerkraut	50	3
Sausage	60	2
Spinach and other greens	60	3
Squash	40	3
Strawberries	7	3
Succotash	60	2 or 3
Sweet potatoes	80	3
Tomato juice	20	2
Tomatoes	22	2 or 3
Tomatoes and corn	80	2

15. *Removing* the jars by inserting a buttonhook in the clamp of glass-top jars, or by means of a thick holder in the right hand, having a second holder ready in the left hand to support the hot jar as it is taken out.

16. *Setting the jars* on several thicknesses of cloth, fastening the lower clamps and inverting the jars on the cloth, Leave in this position to cool.

Water-seal outfits and steam pressure canners are modifications of this method.

Advantages. The preparatory work may be done outdoors. There is no necessity of working over a hot stove. Materials and utensils are handled cold. Jars do not need separate sterilization. Fruits keep their natural color and are not cooked to pieces. Results are more certain than by other methods.

Objections. Rubbers may work out during the sterilizing process. This is always caused by using rubbers of poor quality and must be guarded against. Fruits may cook down so that the jars are not full. This affects only the appearance — not the keeping qualities — as every air-bubble is sterilized. If jars are opened to refill them or to replace rubbers, it is safer to repeat sterilization.

RECIPES FROM THE U. S. DEPARTMENT OF AGRICULTURE

Windfall Apples

(NOTE.— For canning whole apples, choose firm, not overripe apples. A great difference in the canned products will be noted in the different varieties of apples. The recipe below is intended for firm, and preferably tart, varieties. Some varieties will require less time, and some more than is here indicated. Experience will teach adjustment of time.)

Remove blemishes and cut out core. Blanch for five minutes in boiling water; plunge into cold water. Pack in tin cans or glass jars and add very thin syrup to fill spaces in the can.

To make the syrup, mix one and one-half pints of sugar and one pint of water, and heat to the boiling point.

Adjust rubber and top on glass jars and close loosely. (Cap and tip cans.) Sterilize for fifteen minutes in hot-water bath, or thirteen minutes in water-seal outfit, or ten minutes under steam pressure, or six minutes in pressure cooker. Remove jars, tighten covers, and invert to cool.

If the apples are canned in this way, enormous waste will be eliminated and the product will be available for apple salads, dumplings, breakfast apple dishes and the like.

Windfall Apples for Pie Filling

Peel, core, and slice apples. Scald for two minutes in boiling water; plunge in cold water. Pack in glass or tin cans and add about one teacupful of hot, thin syrup to each quart can. Adjust rubber and top on glass can, and close loosely. (Cap and tip cans.) Sterilize for sixteen minutes in hot-water bath, or twelve minutes in water-seal outfit, or ten minutes under five pounds of steam, or four minutes in pressure cooker. Remove jars, tighten covers, and invert to cool.

The fact that the can is not filled with liquid in no way interferes with the keeping qualities of apples canned in this manner.

OVEN METHOD

In using the oven method of canning, the jars and tops must be sterilized by boiling at least twenty minutes. The fruit, prepared as in the cold pack method, is packed raw into the jars, and the jars are filled to overflowing with hot syrup. The rubbers are dipped in boiling water and adjusted, the glass tops put on, and the upper clamp fastened. (If screw-top jars are used, screw as tightly as can be done by using the thumb and little finger.) Place in a moderate oven on a sheet of asbestos paper or in two inches of water in a pan, and cook twenty minutes. Remove, fasten lower clamp, or tighten screw top, and treat jars as in cold pack method.

Advantages. This process may be used at the same time with the cold pack or other methods, if the object is to get large quantities of fruit put up in a given time.

Objections. Flavor and appearance of the fruit are less attractive than by the cold pack method. The jars require separate sterilization. The process is costly in the matter of fuel. It means working in a hot kitchen.

Pears Canned in the Oven

8 quarts pears

1 quart sugar

3 quarts water

Cover the bottom of the oven with a sheet of asbestos paper. Sterilize the jars, prepare the fruit, fill the hot jars with fruit and

add hot syrup till jars overflow. Adjust rubbers and tops and fasten upper clamp. Cook in the oven for twenty minutes. Remove and proceed as in cold pack method.

Pears and peaches require about one pint of syrup to each quart jar of fruit; small fruits, like currants, require about one-half pint to each quart jar.

FIRELESS COOKER METHOD

Sterilize jars and tops as in the preceding method. Pack the fruit raw and fill to overflowing with boiling syrup. Dip the rubbers in boiling water, adjust rubbers and tops, and fasten both clamps. (Or fasten the screw-top as tight as possible.) Without giving the jars a chance to cool, set them in the fireless cooker kettle (which has been previously warmed) and fill the kettle entirely full of boiling water. Close the kettle, place at once in the fireless cooker, and leave over night.

Advantages. Fruits canned by this method most closely resemble fresh fruits in color and flavor. They do not cook away. They require no attention after being placed in the cooker. There is great saving of discomfort from heat. It takes less fuel than any other method.

Objections. The jars require separate sterilization. Unless the cooker is very large, it accommodates only a limited number of jars at a time. The process is slow.

Whole Peaches Canned in the Fireless Cooker

Loosen the skins by pouring boiling water over the fruit. Plunge it into cold water and remove the skins, being careful not to pull off any of the pulp. Pack into sterilized jars. Use halves to fill spaces, having the curved side toward the outside of the jar. Fill the jar with boiling syrup made by boiling equal parts of sugar and water together for ten minutes. Adjust rubbers and tops, and fasten both clamps. Put into the fireless cooker kettle, which has been warmed, and fill the kettle with boiling water. Cover and transfer to the fireless cooker. Fasten the cooker and leave the fruit all night or until cool.

THE OLD-FASHIONED OPEN-KETTLE METHOD

The jars and tops are sterilized as in the two last-named processes. The fruit is cooked till tender in an open kettle and packed hot into the sterilized jars, and boiling syrup is added until the jar overflows. The rubbers are dipped in boiling water and adjusted, the tops put on, and the jars at once fastened tight.

Advantages. It is possible to watch every step of the process and to remove any pieces of fruit that may have cooked tender sooner than others.

Disadvantages. Separate sterilization of jars and fruit is necessary. It takes long hours of work over a hot stove. The danger of infection by microorganisms during the process of filling the jars makes the result of our work uncertain.

Chipped Pears (cooked in open kettle)

Wipe and stem hard pears. Slice in very small chips. For 4 pounds of pears, allow the juice and grated rind of 2 lemons, 3 pounds of sugar, and $\frac{1}{8}$ pound of scraped ginger root or $\frac{3}{4}$ pound of Canton ginger. Allow $\frac{1}{2}$ cup of water for every pound of sugar. Cook all together very slowly for about three hours. It should be a reddish brown in color when done.

The above is so rich that it may be kept in a crock. Whenever a very heavy syrup is used, there is less danger from spoiling, even by the open-kettle method. Therefore, this method still has its place in the making of jellies, jams, marmalades, etc., in which sugar acts as a preservative.

JELLIES

Jellies are a product of definite proportions of fruit-acid, sugar, and the jelly-making element in fruit known as pectin. Failure is more often due to the use of too much sugar than to any other cause. If the fruit is watery, the pound-for-pound proportion will not give good results. Less sugar must be used. The fruits best adapted for jelly-making are currants, slightly underripe grapes, and sour apples. The acid element is a necessary part of the combination. Wild fruit such as grapes, raspberries, blackberries, and even blueberries, are all well adapted to jelly-making,

and thus may be used to supply deficiencies in the home garden. Apples are especially rich in pectin, and are often added to other fruits for this reason.

To prepare small fruits for jelly-making, after they have been looked over and washed, put them in a saucepan with a weight on them. Then add water until you can see it. Cover the saucepan and simmer until the juice is cooked out. Strain the fruit through a sieve into a jelly-bag and suspend the bag to drip until all the juice has run through.

(For preparing a second and third extraction of juice, see Cornell Reading Course Lesson for Farm Home, Vol. I, No. 15, on "Principles of Jelly-making.")

For each cup of juice allow from $\frac{3}{4}$ to 1 cup of sugar. Boil the strained fruit juice twenty minutes, then add the sugar (which has been previously heated), stir until dissolved, and boil exactly three minutes. There are many tests for determining the exact moment when the boiling mass will "jell" satisfactorily, but the writer has found the above a safe rule to follow.

Fruit Juices

Extracted fruit juice may be canned by the cold-pack method and made into jelly as needed, or fruit juices may be prepared with a slight amount of sugar to be used as beverages. Fruit juices may be made from unconsidered fragments of fruit, as in converting a few left-over raspberries into that delectable summer drink, raspberry vinegar. It is not at all necessary to have large quantities to work with, nor is it necessary to go through any complicated process of manufacture in order to get good results. Cover raspberries with vinegar and let them stand over night. In the morning strain as for jelly. Allow a cup of sugar for every cup of juice, and boil sugar and juice together for five minutes. Bottle, or put into fruit-jars.

When served as a beverage, use one part of the juice to three or four parts of water.

References:

Farmers' Bulletins, U. S. Department of Agriculture

Use of Fruit as a Food, No. 293

Care of Food in the Home, No. 375

Canned Fruits, Preserves, and Jellies, No. 203

Canning Peaches on the Farm, No. 426

Cornell Reading Courses

Principles of Jelly-making

The Preservation of Food in the Home, Parts 1, 2, 3

Canning Clubs in New York State, Parts 1, 2, 3

Bulletin of Massachusetts Agricultural College

Canning of Fruits and Vegetables

New York State Department of Agriculture

The New York State Farm Home and Suggestions for the Housewife



PROMISE OF PLENTY

INDEX

A

- Abundance plum, 1161.
- Agawam blackberry, 1376.
- American plum borer, 1189.
- Anderson, E. H., Peaches in Western New York, 1069-1076.
- Anjou pear, 997, 998, 1003.
- Anthony, R. D., Hybrid Grapes at Geneva, 1331-1338.
- Anthracnose on black raspberry, 1363.
- Aphis, peach, black, 1094, 1095.
plum, 1187, 1188.
- Aphis galls of peach, 1106, 1107.
- Apple, cake, 1406.
sauce, 1405.
- Apples,
baked, 1405.
cooked filling for pies, 1405.
in dietary, 1404-1407.
raw filling for pies, 1906.
windfall, preserving, for pie filling, 1413.
whole, 1412.
- Arch Duke plum, 1163.
- Arsenate of lead as spray, 1025, 1032, 1033, 1034, 1096, 1144, 1146, 1148, 1149, 1184, 1211, 1297, 1305, 1312, 1358, 1385.

B

- Bailey, L. H., A Look Backward on the Grape, 1219-1227.
- Bark beetles, 1099-1102, 1188.
- Barley as cover crop, 1009, 1141.
- Barrus, M. F., Diseases of Pears, 1039-1051.
- Bartlett pear, 993, 1001.
- Bavay plum, 1163.
- Belle of Georgia peach, 1063.
- Beurre, Bosc pear, 995, 996, 1004.
Clairgeau pear, 996, 997, 1005.
d'Anjou pear, 997, 998, 1003.
- Bing cherry, 1125, 1127.

- Black, knot of plum, 1190-1192.
peach aphid, 1094, 1095.
raspberries, 1360-1366.
culture, 1362, 1363.
diseases, 1358, 1363.
anthracnose, 1363.
cane blight, 1358.
orange rust, 1363.
yellows, 1358.
insects, 1363.
location and soil, 1360.
manure and fertilizers, 1360.
marketing, 1365.
propagation, 1362.
pruning, 1362.
varieties, 1365, 1366.
rot disease of grapes, 1314-1316.
Tartarian cherry, 1127.
- Blackberry and Dewberry, The, 1369-1377.**
- Blackberries and Dewberries, O. M. Taylor, 1371-1377.
culture, 1373, 1374.
diseases, 1374.
insects, 1374.
location and soil, 1371.
manure and fertilizers, 1371, 1373.
marketing, 1376.
propagation, 1373.
pruning, 1374.
varieties, 1376, 1377.
- Blake, M. A., Pruning the Peach, 1084-1092.
- Blight, fire, 1039-1048.
cause of, 1041.
conditions favorable to infection, 1043, 1044.
control methods, 1044-1048.
life history of, 1041-1043.
pruning for, 1009, 1017, 1018.
symptoms of, 1039-1041.
leaf, of peach, 1050, 1051.

- Blister mite, 1037, 1038.
 Bordeaux mixture as spray, 1011, 1025, 1049, 1051, 1110, 1184, 1198, 1199, 1211, 1297, 1308, 1312, 1316, 1320, 1385.
 Borer, currant, 1386.
 Borers, peach, 1097-1105.
 lesser peach, 1098.
 peach-tree, 1102-1105.
 peach-twig, 1098.
 removal of, 1080, 1081.
 shot-hole, or bark beetles, 1099-1102.
 pear, 1019-1022.
 flat-headed, 1021, 1022.
 round-headed, 1021, 1022.
 sinuate, 1019, 1020.
 Bose pear, 995, 996, 1004.
 Boskoop Giant currant, 1388.
 Bradshaw plum, 1163.
 Bray's Rareripe peach, 1065.
 Brighton grape, 1228.
 Briton blackberry, 1376.
 Brown, H. L., Quinces, 1209-1213.
 Brown rot disease, of peach, 1109, 1110.
 of plum, 1192-1195.
 control methods, 1195.
 Buckwheat as cover crop, 1140.
 Bud moth, 1032.
 Burbank plum, 1163, 1165.

C

- Cane blight, of currant, 1386.
 of raspberry, 1358.
 Canning fruit, as means of saving surplus, 1408, 1409.
 cold-pack method, 1409-1413.
 apples preserved by, 1412, 1413.
 time-table for, 1410, 1411.
 fireless cooker method, 1414.
 peaches preserved by, 1414.
 open-kettle method, 1415.
 chipped pears canned by, 1415.
 oven method, 1413, 1414.
 pears canned by, 1413, 1414.
 Cape grape, introduction of, 1222, 1224, 1231, 1233.

- Carman peach, 1062.
 Catawba grape, characteristics of, 1230.
 introduction of, 1222, 1331.
 sections adapted to, 1239-1241.
 Central Lakes grape-growing section, 1238, 1244, 1245, 1249.
 Champagne industry in New York, 1262-1265.
 Champion, currant, 1388.
 peach, 1062, 1063.
 Chautauqua Belt, as a grape-growing section, 1238, 1244, 1249, 1251, 1268.
 Production and Marketing of Grapes in, S. J. Lowell, 1322-1330.
 buyers unwilling to pay for quality, 1326, 1327.
 climatic requirements, 1329.
 cooperative selling, 1325, 1326.
 cultural methods, 1328, 1329.
 foundation of industry, 1322, 1323.
 harvesting, 1327.
 magnitude of industry, 1329, 1330.
 package, evolution of, 1323, 1324.
 need of standard, 1324.
 primitive methods of shipping, 1324, 1325.
 pruning, 1329.
 varieties, popular, 1327.
 Chautauqua, gooseberry, 1396.
 system of pruning grapevines, 1288.
 Cherry, The, 1121-1157.
 Cultural Methods in Growing, W. L. McKay, 1135-1142.
 adaptation of varieties to market, 1135.
 cover crops, 1140, 1141.
 cultivation, 1141, 1142.
 drainage, 1139.
 essentials for vigorous growth, 1135-1139.
 pruning, 1142.
 spraying, 1139, 1140.

Cherry — *Continued.*

- Diseases of the, L. R. Hesler,
1150, 1151.
brown rot, 1192-1195.
leaf spot, 1195-1198.
powdery mildew, 1150.
fruit-flies, 1145, 1146.
Insects, C. R. Crosby, 1143-1149.
fruit-flies, 1145, 1146.
pear slug, 1147, 1148.
plant louse, 1146, 1147.
plum curculio, 1143, 1144.
red cherry leaf-beetle, 1148,
1149.
San José scale, 1148.
leaf beetle, red, 1148, 1149.
Marketing, C. K. Scoon, 1152-
1155.
harvesting, 1154, 1155.
increase of planting, 1152-
1154.
methods of packing, 1154.
study demand of market,
1152.
plant louse, 1146, 1147.
statistics, 1156, 1157.
Varieties of, U. P. Hedrick, 1123-
1134.
Bing, 1125, 1127.
Black Tartarian, 1127.
Coe, 1127.
Dukes, 1133, 1134.
May, 1133, 1134.
Late, 1133.
Reine Hortense, 1134.
Early Purple, 1127.
Early Richmond, 1123.
Elton, 1129.
English Morello, 1125.
Ida, 1129.
Lambert, 1129.
Montmorency, 1123, 1125.
Napoleon, 1131.
Schmidt, 1131.
Windsor, 1131.
Wood, 1133.
Yellow Spanish, 1133.
Cherry currant, 1388.
Chipped pears, recipe for canning,
1415.
Clairgean pear, 996, 997, 1005.
Clapp's Favorite pear, 993, 1000,
1001.
Clinton grape, 1230.
Clover as cover crop, 1009, 1141.
Codling moth, 1024, 1025.
Coe cherry, 1127.
Cold-pack method of canning fruits,
1409-1413.
Common Insect Enemies of the Plum,
F. H. Lathrop, 1183-1189.
Concord grape, characteristics of,
1230.
origin of, 1227.
sections adapted to, 1238, 1239.
Control of Insects Injurious to
Grapes, F. Z. Hartzell, 1296-1313.
Cornell, J. R., Varieties of Pears for
Eastern New York, 991-999.
Cover crops, in cherry orchard, 1140,
1141.
in grape vineyard, 1293.
in peach orchard, 1079, 1080.
in pear orchard, 1009, 1011.
in plum orchard, 1178.
Crosby, C. R., Cherry Insects, 1143-
1149.
Crown gall, of peach, 1106, 1107.
of raspberry, 1359.
Cultural Methods, for Cherry, W. L.
McKay, 1135-1142.
for Grape, F. E. Gladwin, 1272-
1295.
for Peaches, A. T. Henry, 1077-
1083.
for Pears, Ira Pease, 1007-1013.
Cumberland black raspberry, 1366.
Curculio, work of, on cherry, 1143,
1144.
on peach, 1095, 1096.
on pear, 1031, 1032.
on plum, 1183, 1184.
Currant, The, 1379-1388.
Currant, borer, 1386.
plant louse, 1386.
worm, 1385.
Currants, O. M. Taylor, 1381-1388.
culture, 1384, 1385.
diseases, 1386.
cane blight, 1386.

Currants — *Continued.*

- leaf-spot, 1386.
 - insects, 1385, 1386.
 - borer, 1386.
 - plant louse, 1386.
 - San José scale, 1386.
 - worm, 1385.
 - location and soil, 1381.
 - manure and fertilizers, 1381, 1382.
 - marketing, 1386, 1387.
 - propagation, 1382.
 - pruning, 1385.
 - spraying, 1385.
 - varieties, 1387, 1388.
- Cuthbert red raspberry, 1360.

D

- Dana's Hovey pear, 999.
- Dead-arm disease of grape, 1320.
- Delaware grape, characteristics of, 1230, 1231.
 - sections adapted to, 1242.
- Dewberries. See Blackberries.
- Diamond, black raspberry, 1366.
 - grape, 1231.
 - plum, 1165.
- Diana grape, 1231.
- Dietetic Value of Fruit, I. S. Harrington, 1401-1417.
- Diseases, blackberry, 1374.
 - Cherry, L. R. Hesler, 1150, 1151.
 - currant, 1386.
 - gooseberry, 1395.
 - Grape, D. Reddick, 1314-1321.
 - Peach, L. F. Strickland, 1094-1115.
 - Pear, M. F. Barrus, 1039-1051.
 - Plum, L. R. Hesler, 1190-1199.
 - quince, 1211.
 - raspberry, black, 1363.
 - red, 1358, 1359.
- Downing gooseberry, 1396.
- Downy mildew of grapes, 1316-1318.
- Doyenne d'Été pear, 999.
- Drainage, importance of proper, 1139, 1173, 1275.
- Drooping type of pruning grapevines, 1282.
- Duane plum, 1165.

- Duchess d'Angouleme pear, 1005.
- Dufours, efforts of, in propagating grape, 1224-1226.
- Dutchess grape, 1231, 1232.

E

- Early, Belle peach, 1062.
- Purple cherry, 1127.
- Richmond cherry, 1123.
- Eastern New York, Peaches for, P. L. Husted, 1061-1068.
- Pears for, Varieties of, J. R. Cornell, 991-999.
- Eclipse grape, 1232.
- Elberta peach, 1061, 1062.
- Eldorado blackberry, 1377.
- Elton cherry, 1129.
- English Morello cherry, 1125.
- Erie blackberry, 1377.
- Eureka black raspberry, 1366.
- European, fruit Lecanium, 1186, 1187.
 - fruit-tree scale, 1186.

F

- False tarnished plant bug, 1025, 1026, 1096.
- Fan system of pruning grapevines, 1288, 1289.
- Farrand, A., Packing and Marketing Pears, 1052-1055.
- Pruning Pear Trees, 1015-1018.
- Fay currant, 1388.
- Fertilizers, for blackberries and dewberries, 1371, 1373.
 - for currants, 1381, 1382.
 - for gooseberries, 1393.
 - for grapes, 1293.
 - for peaches, 1080.
 - for plums, 1178, 1180.
 - for quinces, 1209.
 - for raspberries, black, 1360.
 - red, 1355.
- Filler currant, 1388.
- Fire blight, 1039-1048.
- Fireless cooker method of preserving fruit, 1414.
- Flat-headed borer, 1021, 1022.
- Flea-bettle, grapevine, 1301-1303.
- Flemish Beauty pear, 1006.

- Frances peach, 1063.
 French Damson plum, 1165.
 Frey, G., Grape Juice Industry, 1268-1271.
 Frost injury of peach trees, 1113-1115.
 control measures, 1105, 1114, 1115.
 similarity of, to stub canker, 1115.
 Fruit, acid, 1402.
 and cornstarch pudding, recipe for, 1407.
 and nut pudding, recipe for, 1406, 1407.
 canning, 1408-1415.
 cleanliness in serving raw, need of, 1403, 1404.
 cooking, 1404-1416.
 Dietetic Value of, I. S. Harrington, 1401-1417.
 dishes made from, 1405-1408.
 intelligent use of, 1402.
 jellies, 1415.
 juices, 1416.
 mastication of, 1403.
 muffins, recipe for, 1408.
 shortcake, recipe for, 1407, 1408.
 unripe and overripe, dangers of eating, 1403.
 Fruit-flies, cherry, 1145, 1146.
 Fruit Lecanium, 1186, 1187.
 Fruit-tree, bark beetle, 1188.
 leaf roller, 1032, 1033.
 scale, European, 1186.

G

- Geneva, Hybrid Grapes at, R. D. Anthony, 1331-1338.
 German Prune, 1165, 1167.
 Gladwin, F. E., Cultural Methods for Grape in New York, 1272-1295.
 Grape-growing Sections of New York, 1238-1245.
 Gooseberry, The, 1389-1397.
 Gooseberries, O. M. Taylor, 1391-1396.
 culture, 1393.
 insects, 1395.

Gooseberries — *Continued.*

- location and soil, 1391.
 manure and fertilizers, 1393.
 marketing, 1395, 1396.
 mildew, 1395.
 propagation, 1393.
 pruning, 1393, 1395.
 spraying, 1395.
 varieties, 1396, 1397.
 Gouger plum, 1184, 1185.
 Grand Duke plum, 1167.
 Grape, The, 1217-1340.
 A Look Backward on, L. H. Bailey, 1219-1227.
 community effort in early days, 1224.
 early literature, 1219.
 evolution of table grape, 1222-1224.
 fruit of the vine, 1219, 1220.
 influence on man's development, 1220, 1221.
 passing of wine grape, 1221, 1222.
 berry moth, 1309-1313.
 control measures, 1312, 1313.
 damage done by, 1309, 1310.
 life history of, 1311, 1312.
 cheese in wine-making, 1259, 1260.
 Cultural Methods for, F. E. Gladwin, 1272-1295.
 cover crops, 1293.
 essential soil conditions, 1273-1276.
 drainage, 1275.
 preparation for setting, 1275, 1276.
 fertilizers for, 1293.
 location, 1272, 1273.
 manuring, 1293, 1295.
 planting vineyard, 1276-1279.
 laying out, 1276, 1277.
 selection of vines, 1276.
 setting vines, 1277.
 trellis, 1279.
 pruning, 1279-1291.
 tilth and tillage, 1291, 1292.

Grape — *Continued.*

- Diseases of, D. Reddick, 1314–1321.
 - black rot, 1314–1316.
 - dead-arm disease, 1320.
 - downy mildew, 1316–1318.
 - powdery mildew, 1318–1320.
- Growing Sections of New York,
 - F. E. Gladwin, 1238–1245.
 - four principal regions, 1238.
 - varieties grown in, 1244, 1245.
 - sections adapted, to Catawba, 1239–1241.
 - to Concord, 1238, 1239.
 - to Delaware, 1242.
 - to Moore, 1243, 1244.
 - to Niagara, 1241, 1242.
 - to Worden, 1243.
- history of, 1219–1227.
- Hybrid, at Geneva, R. D. Anthony, 1331–1338.
 - experiments of a quarter-century, 1336–1338.
 - pioneer experience, 1331.
 - results following introduction of Isabella and Catawba, 1331–1336.
- Insects Injurious to, F. Z. Hartzell, 1296–1313.
 - berry moth, 1309–1313.
 - flea-beetle, grapevine, 1301–1303.
 - leaf-hopper, 1305–1308.
 - root-worm, 1298–1301.
 - rose chafer, 1304, 1305.
 - general directions for treatment, 1296, 1297.
- Juice Industry, G. Frey, 1268–1271.
 - growth of, 1271.
 - in Chautauqua Belt, 1268.
 - statistics relative to, 1269, 1270.
- leaf hopper, 1305–1308.
 - characteristics of, 1305, 1306.
 - control measures, 1307, 1308.
 - clean culture in relation to, 1308.
 - life history, 1306, 1307.

Grape — *Continued.*

- Marketing, Production and, in Chautauqua Belt, S. J. Lowell, 1322–1330.
- pruning, 1279–1291.
 - proper time for, 1280.
 - types of, 1280–1291.
 - Chautauqua, 1288.
 - drooping, 1282.
 - fan, 1288, 1289.
 - high renewal, 1285, 1286.
 - horizontal, 1289–1291.
 - horizontal arm spur, 1288.
 - one-wire Kniffen, 1284, 1285.
 - single-stem, four-cane Kniffen, 1282, 1283.
 - two-stem, four-cane Kniffen, 1283.
 - umbrella Kniffen, 1284.
 - upright, 1285.
 - Y-stem Kniffen, 1284.
- root-worm, 1298–1301.
 - characteristics of, 1298, 1299.
 - control measures, 1299.
 - destruction of pupae, 1299–1301.
- statistics, 1339, 1340.
- Varieties of, U. P. Hedrick, 1228–1237.
 - Brighton, 1228.
 - Catawba, 1230.
 - Clinton, 1230.
 - Concord, 1230.
 - Delaware, 1230, 1231.
 - Diamond, 1231.
 - Diana, 1231.
 - Dutchess, 1231, 1232.
 - Eclipse, 1232.
 - Iona, 1232.
 - Jefferson, 1232, 1233.
 - Lindley, 1233.
 - Moore Early, 1233.
 - Niagara, 1235.
 - Vergennes, 1235.

Grape — *Continued.*Varieties — *Continued.*

Winchell, 1235, 1237.

Worden, 1237.

wine-making, 1246-1267.

varieties used, 1253.

Grapevine flea-beetle, 1301-1303.

control measures, 1303.

Green fruit worms, 1033, 1034.

Greensboro peach, 1062.

Gregg black raspberry, 1366.

Gueii plum, 1167.

Gulley, A. G., Packing and Marketing the Peach, 1116, 1117.

H

Hale, J. H., peach, 1062.

Harrington, I. S., Dietetic Value of Fruit, 1401-1417.

Hartzell, F. Z., Control of Insects Injurious to Grape, 1296-1313.

Hedrick, U. P., Varieties, of Cherries, 1123-1134.

of Grapes, 1228-1237.

of Plums, 1161-1171.

Heiley peach, 1062.

Henry, A. T., Cultural Methods for the Peach, 1077-1083.

Herbert red raspberry, 1360.

Hesler, L. R., Diseases, of the Cherry, 1050, 1051.

of the Plum, 1190-1199.

High renewal type of pruning grapevines, 1285, 1286.

Hop plant louse, 1187.

Horizontal, arm spur system of pruning grapevines, 1288.

system of pruning grapevines, 1289-1291.

Howe, G. H., Cultural Method and Pruning for Plums and Prunes, 1172-1182.

Marketing Plums and Prunes, 1200-1203.

Hudson Valley grape-growing section, 1238, 1245, 1249.

Husted, P. L., Peaches in Eastern New York, 1061-1068.

Hybrid Grapes at Geneva, R. D. Anthony, 1331-1338.

I

Ida cherry, 1129.

Industry gooseberry, 1396.

Insects, blackberry, 1374.

Cherry, C. R. Crosby, 1143-1149.
currant, 1385, 1386.

gooseberry, 1395.

Grape, F. Z. Hartzell, 1296-1313.

Pear, P. J. Parrott, 1019-1038.

Plum, F. H. Lathrop, 1183-1189.
quince, 1211.

raspberry, black, 1363.

red, 1356, 1357.

Intercopping peach orchard, 1079, 1080.

pear orchard, 1009.

Iona grape, 1232.

Iron Mountain peach, 1065.

Isabella grape, introduction of, 1222, 1224, 1331, 1333.

Italian prune, 1167, 1169.

J

Jefferson grape, 1232, 1233.

Jellies, fruit, recipe for making, 1415, 1416.

Josselyn gooseberry, 1396.

Juices, fruit, recipe for preserving, 1416.

June red raspberry, 1316.

K

Kansas black raspberry, 1366.

Kerosene emulsion as spray, 1024, 1036, 1187, 1188, 1386.

Kieffer pear, 991, 1003, 1004.

Kittatinny blackberry, 1377.

Kniffen systems of pruning grapevines, 1282-1285.

one-wire, 1284, 1285.

single-stem, four-cane, 1282, 1283.

two-stem, four-cane, 1283.

umbrella, 1284.

Y-stem, 1284.

L

Lake Ontario grape-growing section, 1238, 1245, 1249, 1251.

Lambert cherry, 1129.

Late Duke cherry, 1133, 1134.
 Lathrop, F. H., Common Insect
 Enemies of the Plum, 1183-1189.
 Lawrence pear, 999, 1006.
 Leaf, curl disease of peach, 1110.
 rollers, 1032, 1033.
 spot, of currant, 1386.
 of pear, 1049, 1050.
 of plum, 1195-1198.
 Leaf-beetle, red cherry, 1148, 1149.
 Leaf-hopper, grape, 1305-1308.
 Lecanium, European fruit, 1186.
 quince, 1211.
 Lesser peach borer, 1098, 1189.
 Lime-sulphur as spray, 1013, 1023,
 1024, 1036, 1038, 1049, 1051, 1067,
 1096, 1098, 1099, 1105, 1108, 1110,
 1148, 1151, 1185, 1186, 1187, 1195,
 1198, 1199, 1386, 1395.
 Lindley grape, 1233.
 Little peach disease, 1112, 1113.
 Lombard plum, 1169.
 Look Backward on the Grape, A., L.
 H. Bailey, 1219-1227.
 Louise Bonne de Jersey pear, 1005.
 Lowell, S. J., Production and Market-
 ing of Grapes in Chautauqua Belt,
 1322-1330.
 Lucretia dewberry, 1377.

M

McDonald dewberry, 1377.
 McKay, W. L., Cultural Methods in
 Growing the Cherry, 1135-1142.
 Maggot, cherry fruit-fly, 1145, 1146.
 Manning's Elizabeth pear, 999.
 Marketing, blackberries, 1376.
 Cherries, C. K. Scoon, 1152-1155.
 currants, 1386, 1387.
 gooseberries, 1395, 1396.
 Grapes in Chautauqua Belt, S. J.
 Lowell, 1322-1330.
 peaches, 1068, 1074, 1082 1083,
 1117
 Pears, A. Farrand, 1052-1055.
 Plums and Prunes, G. H. Howe,
 1200-1203.
 raspberries, black, 1365.
 red, 1359.

Marlboro red raspberry, 1360.
 Marldon red raspberry, 1360.
 May Duke cherry, 1133, 1134.
 Mayes dewberry, 1377.
 Mayflower peach, 1062.
 Mealy plum louse, 1187, 1188.
 Mersereau blackberry, 1377.
 Midge, pear, 1026.
 Mildew, of gooseberry, 1395.
 of grapes, 1316-1320.
 downy, 1316-1318.
 powdery, 1318-1320.
 Miscible oils as spray, 1023, 1029,
 1033, 1186, 1187.
 Monarch plum, 1169.
 Montmorency cherry, 1123, 1125.
 Moore Early grape, characteristics
 of, 1233.
 sections adapted to, 1243, 1244.

N

Napoleon cherry, 1131.
 Nelis pear, 997, 1005.
 New Rochelle blackberry, 1377.
 New York, Eastern, Peaches in, P. L.
 Husted, 1061-1068.
 Pears for, Varieties of, J.
 R. Cornell, 991-999.
 Grape-Growing Sections of, F. E.
 Gladwin, 1238-1245.
 Western, Peaches in, E. H. Ander-
 son, 1069-1076.
 Pears for, Varieties of, I.
 Pease, 1000-1006.
 Wine Industry, L. J. Vance,
 1246-1267.
 Niagara, grape, characteristics of,
 1235.
 sections, adapted to, 1242.
 grape-growing district, 1238,
 1245, 1249, 1251.
 Nicotine in spray, 1026, 1029, 1036,
 1037, 1147, 1188, 1308, 1358.

O

Oats as cover crop, 1141.
 Oblique-banded leaf-roller, 1032, 1033.
 One-wire Kniffen system of pruning
 grapevines, 1284, 1285.

Open-kettle method of canning fruit, 1415.
 Orange rust of black raspberry, 1363.
 Oven method of canning fruit, 1413, 1414.
 Overripe fruit, dangers of eating, 1403.
 Oyster-shell scale, 1023, 1024.

P

Packing and Marketing Pears, A. Farrand, 1052-1055.
 Palmer black raspberry, 1366.
 Palmer, W., Strawberries, 1343-1347.
 Parrott, P. J., Insects Attacking the Pear, and Their Control, 1019-1038.
 Peach, The, 1059-1119.
 aphis, black, 1094, 1095.
 borer, lesser, 1098.
 canning by fireless cooker, 1414.
 Cultural Method for, and Marketing, A. T. Henry, 1077-1083.
 care when fruiting, 1081.
 cultivation and intercropping, 1079, 1080.
 distance between trees, 1078.
 fertilizers, 1080.
 harvesting, 1081.
 importance of good stock, 1078.
 location of orchard, 1077, 1078.
 low-headed trees desirable, 1079.
 protection from animals, 1080.
 removal of borers, 1080, 1081.
 setting trees, method of, 1079.
 varieties to plant, 1078.
 Diseases, Insects and, L. F. Strickland, 1094-1115.
 brown rot, 1109, 1110.
 crown gall, 1106, 1107.
 frost injury, 1113-1115.

Peach — *Continued.*Diseases — *Continued.*

 leaf curl, 1110.
 little peach, 1112, 1113.
 peach spot, or scab, 1107, 1108.
 powdery mildew, 1107.
 shot-hole of foliage, 1108, 1109.
 yellows, 1111.
 in Eastern New York, P. L. Husted, 1061-1068.
 location and climatic requirements, 1065, 1066.
 market conditions, 1068.
 susceptibility to disease, 1066, 1067.
 varieties and characteristics, 1062-1065.
 in Western New York, E. H. Anderson, 1069-1076.
 cultural methods, 1070.
 marketing, 1074.
 pruning, 1071, 1073.
 soils and fertilization, 1069, 1070.
 uncertainty of crop, 1075, 1076.
 varieties grown, 1073, 1074.
 Insects, Diseases and, L. F. Strickland, 1094-1115.
 black aphis, 1094, 1095.
 borers, 1097-1105.
 peach-twigg, 1098.
 lesser peach, 1098.
 shot-hole, 1099-1102.
 peach-tree, 1102-1105.
 curculio, 1095, 1096.
 plant bugs, 1096, 1097.
 San José scale, 1097.
 leaf curl, 1110.
 Marketing, Packing and, A. G. Gulley, 1116, 1117.
 Pruning, M. A. Blake, 1084-1092.
 at close of first season, 1086-1090.
 during second and third years, 1090-1092.

Peach — *Continued.*Pruning — *Continued.*

following winter injury,
1092.

importance of thorough,
1093.

nursery trees at time of
planting, 1085, 1086.

old trees, 1093.

reasons for, 1084, 1085.

scab disease, 1107, 1108.

spot disease, 1107, 1108.

statistics, 1118, 1119.

tree borers, 1102-1105, 1189.

control measures, 1104, 1105.

twig borer, 1098.

varieties, 1061-1065, 1074, 1075,
1112.

yellows, 1111.

Pear, The, 989-1057.

blight, 1011.

pruning for, 1017, 1018.

Cultural Methods for, Ira Pease,
1007-1013.

care in setting, 1007.

cover crops for, 1009, 1011.

distance of planting, 1007.

in relation to blight, 1011.

insect enemies, 1011, 1012.

intercropping, 1009.

pruning, 1009.

Diseases of, M. F. Barrus, 1039-
1051.

fire blight, 1039-1048.

leaf blight, 1050, 1051.

leaf spot, 1049, 1050.

scab, 1048, 1049.

Insects Attacking the, and Their
Control, P. J. Parrott,
1019-1038.

blister mite, 1037, 1038.

borers, 1019-1022.

flat-headed, 1021, 1022.

round-headed, 1021,
1022.

sinuate, 1019, 1020.

bud moth, 1032.

codling moth, 1024, 1025.

curculio, 1031, 1032.

Pear — *Continued.*Insects — *Continued.*

false tarnished plant bug,
1025, 1026.

green fruit worms, 1033,
1034.

leaf rollers, 1032, 1033.

midge, 1026.

oyster-shell scale, 1023, 1024.

psylla, 1011, 1013, 1034-
1037.

San José scale, 1011, 1022,
1023.

scurfy scale, 1024.

slug, 1037.

thrips, 1028-1031.

midge, 1026.

Marketing, Packing and, A. Far-
rand, 1052-1055.

advisability of law regulat-
ing packing, 1052.

establishing a market, 1054,
1055.

importance of proper pack-
ing, 1052, 1054.

selling through commission
houses, 1055.

Pruning, A. Farrand, 1015-1018.

for blight, 1009, 1017, 1018.

importance of proper, 1015.

methods of, 1017.

purpose of, 1015, 1016.

winter, 1017.

psylla, 1011, 1013, 1034-1037.

treatment for, 1035-1037.

scab, 1048, 1049.

slug, 1037, 1147, 1148.

statistics, 1056, 1057.

thrips, 1028-1031.

treatment for, 1029.

Varieties of, for Eastern New
York, J. R. Cornell
991-999.

Bartlett, 993.

Beurre Bosc, 995, 996.

Beurre Clairgeau, 996,
997.

Beurre d'Anjou, 997.

Clapps Favorite, 993.

Comice, 999.

Pear — Continued.**Varieties — Continued.**

Dana's Hovey, 999.
 Doyenne d' Eté, 999.
 Kieffer, 991.
 Lawrence, 999.
 Manning's Elizabeth, 999.
 Seckel, 993, 995.
 Tyson, 999.
 Winter Nelis, 997.
 Worden Seckel, 998.
for Western New York, I.
 Pease, 1000-1006.
 Bartlett, 1001.
 Beurre Bosc, 1004.
 Beurre Clairgeau, 1005.
 Beurre d'Anjou, 1003.
 Clapp's Favorite, 1000, 1001.
 Duchess D'Angouleme, 1005.
 Flemish Beauty, 1006.
 Kieffer, 1003, 1004.
 Lawrence, 1006.
 Louise Bonne de Jersey, 1005.
 Seckel, 1001.
 Sheldon, 1003.
 Tyson, 1005.
 Vermont Beauty, 1006.
 Winter Nelis, 1005.
 Worden Seckel, 1005.

Pearl gooseberry, 1396.

Pease, Ira, Cultural Methods for Pears, 1007-1113.

Varieties of Pears for Western New York, 1000-1006.

Perfection, currant, 1388.

red raspberry, 1360.

Plant, bugs, 1096, 1097.

louse, cherry, 1146, 1147.
 currant, 1386.

hop, 1187, 1188.

plum, 1187, 1188.

Plum, The, 1159-1205.

aphis, rusty-brown, 1187, 1188.
 bladder, 1198, 1199.
 borer, American, 1189.

Cultural Methods for, G. H. Howe, 1172-1182.

Plum — Continued.**Cultural — Continued**

cover crops, 1178.
 cultivation, 1176.
 drainage, 1173.
 exposure, 1173.
 fertilizers, 1178, 1180.
 location of orchard, 1172.
 planting, 1174-1176.
 pruning, 1180-1182.
 soils suitable for, 1172, 1173.

curculio, 1031, 1032, 1095, 1096, 1143, 1144, 1183, 1184.

Diseases, L. R. Hesler, 1190-1199.

black knot, 1190-1192.

brown rot, 1192-1195.

leaf spot, 1195-1198.

plum pockets, 1198, 1199.

gouger, 1184, 1185.

Insect Enemies, Common, F. H.

Lathrop, 1183-1189.

American plum borer, 1189.

curculio, 1183, 1184.

European, fruit Lecanium, 1186, 1187.

fruit-tree scale, 1186.

fruit-tree bark-beetle, 1188.

gouger, 1184, 1185.

hop plant louse, 1187, 1188.

lesser peach-tree borer, 1189.

mealy plum louse, 1187, 1188.

plant louse, 1187, 1188.

Putnam's scale, 1186.

rusty-brown aphis, 1187, 1188.

San José scale, 1185, 1186.

louse, 1187, 1188.

mealy, 1187, 1188.

plant, 1187.

Marketing, G. H. Howe, 1200-1203.

desirable varieties, 1203.

packing, 1201.

picking, proper time for, 1200, 1201.

problems to be met, 1202.

storing, 1201.

plant louse, 1187.

pockets, 1198, 1199.

Plum — *Continued.*

Pruning, Cultural Methods and,
G. H. Howe, 1172-1182.

statistics, 1204, 1205.

Varieties, U. P. Hedrick, 1161-
1171.

Abundance, 1161.

Arch Duke, 1163.

Bavay, 1163.

Bradshaw, 1163.

Burbank, 1163.

Diamond, 1165.

Duane, 1165.

French Damson, 1165.

German Prune, 1165, 1167.

Grand Duke, 1167.

Gueii, 1167.

Italian Prune, 1167, 1169.

Lombard, 1169.

Monarch, 1169.

Pond, 1169.

Quackenboss, 1171.

Reine Claude, 1171.

Yellow Egg, 1171.

Plum Farmer black raspberry, 1366.

Pond plum, 1169.

Poorman gooseberry, 1396.

Powdery mildew, of cherry, 1150.

of grapes, 1318-1320.

of peach, 1107.

Premo dewberry, 1377.

Preserving fruits. See Canning.

Prince of Wales currant, 1388.

Production and Marketing of Grapes
in Chautauqua Belt, S. J. Lowell,
1322-1330.

Prunes. See Plum.

Pruning, blackberry, 1374.

cherry, 1142.

currant, 1385.

dewberry, 1374.

gooseberry, 1393, 1395.

grapevines, 1279-1291.

Peach, M. A. Blake, 1084-1092.

Pear, A. Farrand, 1015-1018.

plum, 1180-1182.

quince, 1211.

raspberry, black, 1362.

red, 1356.

Purple raspberry, 1366.

Putnam's scale, 1186.

Q

Quackenboss plum, 1171.

Quince, The, 1207-1215.

Quinces, H. L. Brown, 1213-1229.

cultivation for, 1209.

custard, recipe for, 1407.

diseases, 1211.

distance in planting, 1209.

fertilization, 1209.

insect enemies, 1211.

Lecanium, 1211.

marketing, 1213.

pruning, 1211.

statistics, 1214, 1215.

susceptibility of, to leaf blight,
1051.

varieties, 1209.

R

Raspberry, The, 1349-1368.

Raspberries, O. M. Taylor, 1353-1368.

black, 1360-1366.

purple, 1366.

red, 1353-1360.

statistics, 1367, 1368.

Raspberry, cane-borer, 1358.

sawfly, 1358.

Red cherry leaf-beetle, 1148, 1149.

Red raspberries, 1353-1360.

culture, 1355, 1356.

diseases, 1358, 1359.

cane blight, 1358.

crown gall, 1359.

root knot, 1359.

yellow, 1358.

insects, 1356-1358.

cane-borer, 1358.

red spider, 1358.

sawfly, 1358.

snowy tree cricket, 1356.

location and soil, 1353.

manure and fertilizers, 1355.

marketing, 1359.

propagation, 1355.

pruning, 1356.

varieties, 1359, 1360.

Red spider, work of, on raspberry,
1358.

Red Cross currant, 1388.
 Reddick, D., Diseases of Grapes,
 1314-1321.
 Reine Claude plum, 1171.
 Reine Hortense cherry, 1134.
 Root knot, of peach, 1106, 1107.
 of raspberry, 1359.
 Rose chafer, 1304, 1305.
 Round-headed borer, 1021, 1022.
 Rusty-brown plum aphid, 1187, 1188.
 Rye as cover crop, 1009, 1011.

S

Salway peach, 1065.
 San José scale, on cherry, 1148.
 on currant, 1386.
 on peach, 1097.
 on pear, 1011, 1022, 1023.
 on plum, 1185, 1186.
 Scale, European fruit-tree, 1186.
 oyster-shell, 1024.
 Putnam's, 1186.
 San José, 1011, 1022, 1023, 1097,
 1148, 1185, 1186, 1386.
 scurfy, 1024.
 Schmidt cherry, 1131.
 Seoon, C. K., Marketing Cherries,
 1152-1155.
 Scurfy scale, 1024.
 Seckel pear, 993, 995, 1001.
 Worden, 998, 1005.
 Sheldon pear, 996.
 Shortcake, fruit, recipe for, 1407,
 1408.
 Shot-hole, borers, 1099-1102.
 control measures, 1101,
 1102.
 disease, of cherry, 1151.
 of peach foliage, 1108, 1109.
 of plum, 1195-1198.
 Single-stem Kniffen system of prun-
 ing grapevines, 1282, 1283.
 Sinuate borer, 1019, 1020.
 Small fruits, statistics relative to,
 1397, 1398.
 Smock peach, 1065.
 Snowy tree-cricket, 1356.
 Snyder blackberry, 1377.
 Soap in spray, 1024, 1036, 1037, 1188,
 1312, 1358, 1386.

Statistics, cherry, 1156, 1157.
 grapes, 1339, 1340.
 peach, 1118, 1119.
 pear, 1056, 1057.
 plum, 1204, 1205.
 quince, 1214, 1215.
 raspberry, 1367, 1368.
 small fruits, 1397, 1398.
 strawberry, 1348, 1349.
 Stevens Rareripe peach, 1063, 1065.
 Strawberry, The, 1341-1349.
 Strawberries, W. Palmer, 1343-1347.
 advisability of studying varie-
 ties, 1343.
 insects, 1346.
 mulching, 1345.
 picking and marketing, 1346,
 1347.
 soil and cultural methods, 1345.
 statistics, 1348, 1349.
 Strawberry shortcake, recipe for,
 1407, 1408.
 Strickland, L. F., Insects and Dis-
 eases of the Peach, 1094-1115.
 Stub canker of peach trees, 1115.

T

Taylor, O. M., Blackberries and Dew-
 berries, 1371-1377.
 Currants, 1381-1388.
 Gooseberries, 1391-1396.
 Raspberries, 1353-1368.
 Thrips, pear, 1028-1031.
 Time-table for preserving fruits,
 1410, 1411.
 Tip-layer method in propagation of
 black raspberries, 1362.
 Tobacco extract in spray, 1026, 1029,
 1036, 1037, 1147, 1188, 1308.
 Trellis, for dewberries, 1374.
 for grapevines, 1279.
 for raspberries, 1356, 1363.
 Turnips as cover crop, 1009, 1011,
 1140, 1141.
 Two-stem Kniffen system of pruning
 grapevines, 1283.
 Tyson pear, 999, 1005.

U

U. S. Department of Agriculture,
 canning recipes from, 1412, 1413.

Umbrella Kniffen system of pruning grapevines, 1284.
 Unripe fruit, dangers of eating, 1403.
 Upright system of pruning grapevines, 1285.

V

Vance, L. J., The New York Wine Industry, 1246-1267.
 Varieties, of blackberries, 1376, 1377.
 of Cherries, U. P. Hedrick, 1123-1134.
 of currants, 1387, 1388.
 of dewberries, 1377.
 of gooseberries, 1396, 1397.
 of Grapes, U. P. Hedrick, 1228-1237.
 of peaches, 1062-1065, 1078.
 of Pears, for Eastern New York, J. R. Cornell, 991-999.
 for Western New York, I. Pease 1000-1006.
 of Plums, U. P. Hedrick, 1161-1171.
 of raspberries, black, 1365, 1366.
 red, 1359, 1360.
 Vergennes grape, 1235.
 Vermont Beauty pear, 1006.
 Vetch as cover crop, 1009, 1011, 1140, 1141.
 Vinifera hybrid grapes, 1333-1338.
 Viticultural school, advisability of, for New York State, 1266, 1267.

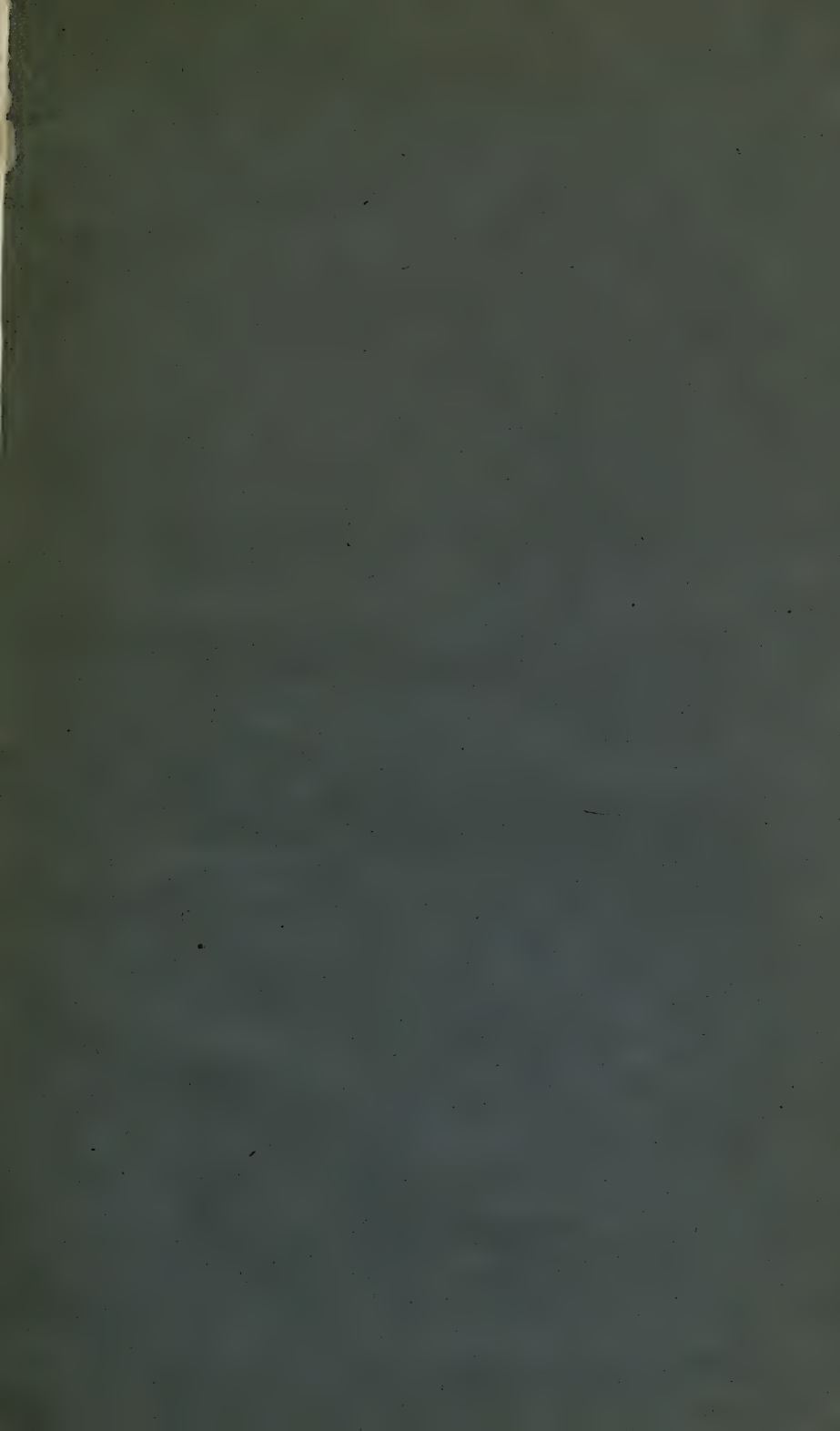
W

Waddell peach, 1062.
 Western New York, Peaches in, E. H. Anderson, 1069-1076.
 Pears for, Varieties of, I. Pease, 1000-1006.
 White, grape currant, 1388.
 grub, work of, on strawberry, 1346.
 Imperial currant, 1388.
 Whitesmith gooseberry, 1396.
 Wilder currant, 1388.
 Willett peach, 1065.
 Wilma peach, 1062.
 Winchell, Grape, 1235, 1237.
 Windfall apples, recipe for canning, 1412, 1413.

Wine, grape, passing of the, 1221.
 Industry, the New York, L. J. Vance, 1246-1267.
 adaptability of New York to, 1247.
 champagne making, 1262-1265.
 classification of wines, 1261.
 extent of, 1246, 1247, 1249.
 four principal districts, 1249-1251.
 kinds of wines made, 1253-1255.
 needs of, 1266, 1267.
 process of wine making, 1258-1261
 crushing and steamming grapes, 1258, 1259.
 fermentation, 1260.
 fining, 1261.
 gathering grapes, 1258.
 pressing, 1259.
 varieties of grapes used, 1251-1253.
 vintage in New York State, 1255-1257.
 presses, types of, 1259.
 Wines, list of, made in New York, 1253, 1255.
 classification of, 1261, 1262.
 Winter, injury, of pear, 1040.
 pruning following, 1092.
 Nelis pear, 997, 1005.
 Wonderful peach, 1065.
 Wood cherry, 1133.
 Windsor cherry, 1131.
 Worden, grape, characteristics of, 1237.
 sections adapted to, 1243.
 Seckel pear, 998, 1005.

Y

Yellow, Egg plum, 1171.
 Spanish cherry, 1133.
 Yellows, disease of red raspberry, 1358.
 peach, 1111.
 Y-stem Kniffen system of pruning grapevines, 1284.





TO

202 Main Library

2

3

4

5

6

Renewals and Recharges may be made 4 days prior to the due date.

Books may be Renewed by calling 642-3405

DEC 04 1993

AUTO DISC CIRC DEC 22 '93

UNIVERSITY OF CALIFORNIA, BERKELEY
BERKELEY, CA 94720

FORM NO. DD6

YC 61813

U. C. BERKELEY LIBRARIES



C046035888

343340

New York

SB 359
N4

DEC 20 1916

79

UNIVERSITY OF CALIFORNIA LIBRARY

